

Review of on-Street Parking Scenario of Motijheel Commercial Area (Dainik Bangla to Shapla Square)

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Abstract

Parking problem is one of the burning issues in transport study for any commercial and business area. Efficient movements of vehicle as well as usages of surrounding lands are greatly affected by provision of parking. Motijheel, the CBD of Dhaka has been experiencing an upsurge of parking demand over the last few decades. To investigate the present on- street parking condition of Motijheel area a study consists of parking inventory survey and parking usage survey by patrol has been conducted from Dainik Bangla to Shapla Square. This study has revealed that overall demand is 2.73 times greater than available supply. Relatively longer duration of parking is mainly responsible for this. To get a more detailed overview different parking considerations like parking accumulation, parking index, parking duration, turnover, spill over etc are also calculated. On the basis of survey and analyses, some recommendations have been provided to improve the situation.

Introduction

Over the last few years, parking has become a major problem of Dhaka City. Behind this steadily deteriorating situation of transportation, parking problem is a major reason. Generally, private car owners prefer on-street parking as it is the most convenient parking in a downtown area. The unprecedented growth of private cars, the unplanned road infrastructure and illegal tenure of footpath have made the provision for on-street parking an important aspect of transportation planning (Ahmed, 2001).

Motijheel is the major business and commercial hub of Dhaka city. More offices and business institutions are located there than any other part of the city as well as it is home to the largest number of corporate headquarters in the nation (Jahan and Amin, 2011). All these activities generate a large volume of parking demand per day. Dainik Bangla – Shapla Square is the major arterial road which connects the Central Business District (CBD) with the city. Though on-street parking is provided along the road to meet up the existing parking demand, there is a huge pressure of on-street parking in this road (Hoque, n.d.). It affects the normal movement of the pedestrian and flow of traffic through the road. As a result, the efficiency of this downtown has been worsening day by day. In this context, on- street parking analysis for Motijheel area along with the road, Dainik Bangla – Shapla Square, is conducted to investigate the actual parking demand – supply scenario and suggest some initiatives to reduce the problem. The objective of this study is to prepare an inventory of on-street parking facilities of Motijheel commercial area and to analyze the existing on-street parking demand and supply conditions of the area.

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The parking survey analysis of the study may help the policy makers to plan for on-street parking policy for a busy commercial area. Policy makers may estimate appropriate future supply to meet up the projected demand using the analysis.

Methodology

Study Area Selection

This survey is undertaken from Dainik Bangla to Shapla Square at Motijheel. This road is situated at the heart of the city and it acts as a major entry point to down town.

Total length of this road section is 0.76 kilometer and average road width is 46 feet consisting of three lanes. Adjacent land of the road is highly congested with multi-stored commercial buildings such as Agrani Bank, Jamuna Bank, City Tower, Kuthir Shilpo Bhavan, Uttara Bank, Marcentile Bank and Islami Bank etc. These buildings are highly accommodated with large number of government and non-government employees. Frequent use of personalized automobile of these people is the main cause of generating huge amount of traffic and intensive parking. On the other hand, a vast number of people come here at different times of the day for their temporary needs.

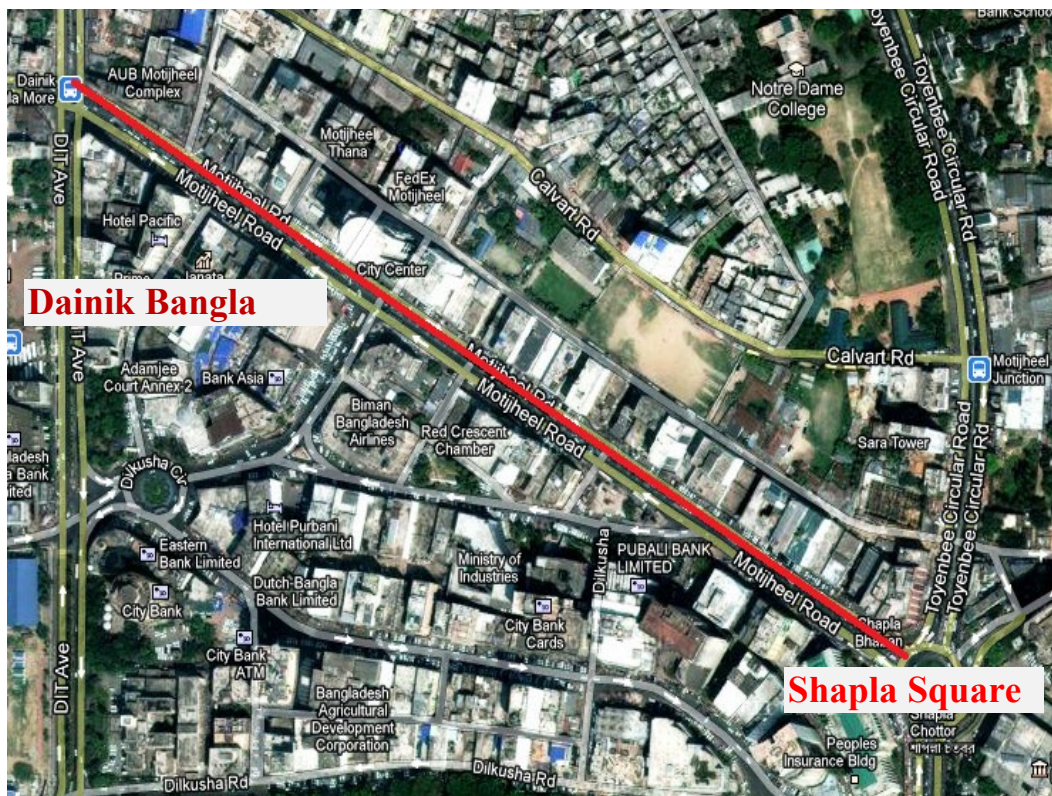


Figure 1: Study Area (Dainik Bangla to Shapla Square); Source: Google Map

Existing Parking Condition Analysis

To analyze the existing on-street parking conditions and characteristics of the adjacent road side from *Dainik Bangla* to *Shapla Square* parking inventory and patrol survey have been conducted. Along with present scenario, demand and supply condition of parking has also been evaluated and following results have been collected:

Parking Facilities

The road section from *Dainik Bangla* to *Shapla Square* is run along with a highly concentrated commercial zone. Out of 37 buildings, 22 commercial buildings have marked on-street parking slots in front of these buildings. On the other hand, unmarked designated parking space has been found in front of 14 buildings. Again, parking is prohibited in front of Grameen Phone building only. All the designated marked spaces are arranged at 45° angles with the road section. Instead of following the marked line, vehicles are usually parked perpendicularly as it uses minimum curb length. In some places such as, in front of Rupali Bank, Janata bank, Birds Bangladesh, UCB Building etc., both parallel and perpendicular parking are found in more than one rows. As a result, effective road width reduces from 46 feet to 30 feet. Along with cars, motor cycles and bicycles are also parked here.

The total available parking bays are 172 space-hour of which marked and unmarked parking spaces are 139 and 33 respectively.

Parking Accumulation and Parking Load

Figure 2 shows the number of parked vehicles at different specific points in time. It also demonstrates the difference between average accumulation and instant accumulation at a specific time. This curve is further used for calculating parking load at different specific time period. For promoting the analysis, the whole survey period (six hours) is divided into 3 segments with a two hour interval each.

Parking Scenario at Morning (9.00 am - 11.00 am)

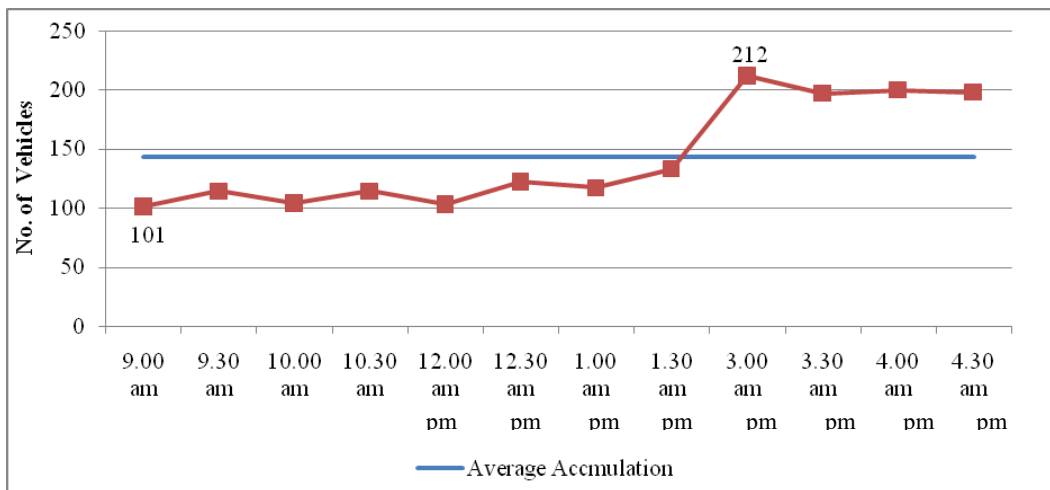


Figure 2: Parking Accumulation Curve for Six Hours Survey (9.00 am -5.00 pm); Source: Field Survey, 2011

From figure 2, it is easily noticeable that the highest number of parked vehicles is found twice at 9.30 am and 10.30 am. It represents the parking demand of this road section for different corresponding time periods in the morning. Parking load is 216.5 vehicle-hour and 25.30% vehicles of a typical day parked here during this period. The load is also the lowest (216.5 vehicle-hr) in this time period. It is seen that the lowest amount of demand for parking occurs in the morning which can be easily managed with the available supply of 172 space/hour. It happens due to the entrance of regular officials in downtown early in the morning. People with temporary needs start to come as the day goes on, resulting in increments in parking demand.

Parking Scenario at Noon (12.00 - 2.00 pm)

At noon, there is no variation in accumulation in the first 1.5 hour but it increases at 1:30 pm with a high peak (Figure 2). Second session of official works usually starts from 2.00 pm. For this, permanent and other officials started to come back after lunch which increases the accumulation of parked vehicles. Although this part of the day has more parking demand than morning but still it is manageable with available parking spaces. Parking load at noon is 237.5 vehicle-hours whereas 27.74% vehicles are parked here during this period.

Parking Scenario at Afternoon (3.00 - 5.00 pm)

This part of the day shows the highest amount of parking accumulation resulting in the highest load (403.5 vehicle-hour) which is beyond the available supply of parking spaces. As offices close this time, a huge number of vehicles come to pick the officials which are not parked here for all the day. After 4:30 pm these vehicles start to depart which causes a decrease in parking accumulation again.

Parking Volume

The total number of parked vehicles is 470 during the survey period of six hours in Dainik Bangla – Shapla Square. 79 vehicles are parked over an hour in the study area denoting the parking load.

Parking Index

For measuring the efficiency of parking, parking index is used. It gives an aggregate measure of how effectively the parking space is utilized. The highest parking index of the study area is found to be 123.26% at 3:00 pm and the lowest parking index is 58.72% at 9:00 am. It denotes that the occupancy ratio of number of parking bays is higher in the afternoon than it is in the morning. The higher parking index value indicates that the 172 parking spaces have been used for 212 times because the parking duration is shorter at this time. During 3:00pm to 3:30pm parking index value exceeds 100%.

Parking Turnover

Parking turnover is the ratio of number of vehicles parked in a time to the number of parking spaces available. Parking turnover has been found to be 0.46 vehicles hr/space. This means that one parking space is used for 0.46 times over an hour. Stating differently, turnover means that throughout the day one parking space is occupied by 2.73 numbers of vehicles for this study in Motijheel area. Higher parking turnover value represents the higher occupancy as well as efficiency of the parking space with a lower average parking duration.

Average Parking Durations

A frequency of 0.5 hour has been considered satisfactory for this survey. During the survey about 23.83% of the cars are found parked for 1.5 hours. A small portion of the cars (0.21%) are found to be parked cars throughout the survey period (8 hours). The average parking duration is 2.2 hours in the study area.

11% vehicles can park in a period of 3.5 hours. If the duration reduces to 1 hour, the space can occupy extra 6.41% vehicles.

Classification of Duration of Parking

Parking duration has been classified into five groups. 46.38% of the vehicles are parked for short duration (1 – 2 hours) and 7.66% vehicles are parked for long duration (4 – 6 hours). Though short duration parking has higher percentage share of vehicles, long duration parking bear higher percentage share of vehicle-hr. It indicates that a small percentage of long duration parking has a huge impact on parking situation of the study area.

Data of very short (< 1 hour) and short duration of parking have been analyzed further to highlight the distribution of the parking among three time periods. These parking are subdivided into continuous parking and discontinuous parking.

Half an hour parking is mainly seen during morning periods where it is quite uncommon during noon. One hour parking is prominent during afternoon period than the morning period. 29.35% of 1.5 hours duration continuous parking is seen at noon. Afternoon takes the largest share of small duration parking resulting in higher value of parking load and parking index at that time.

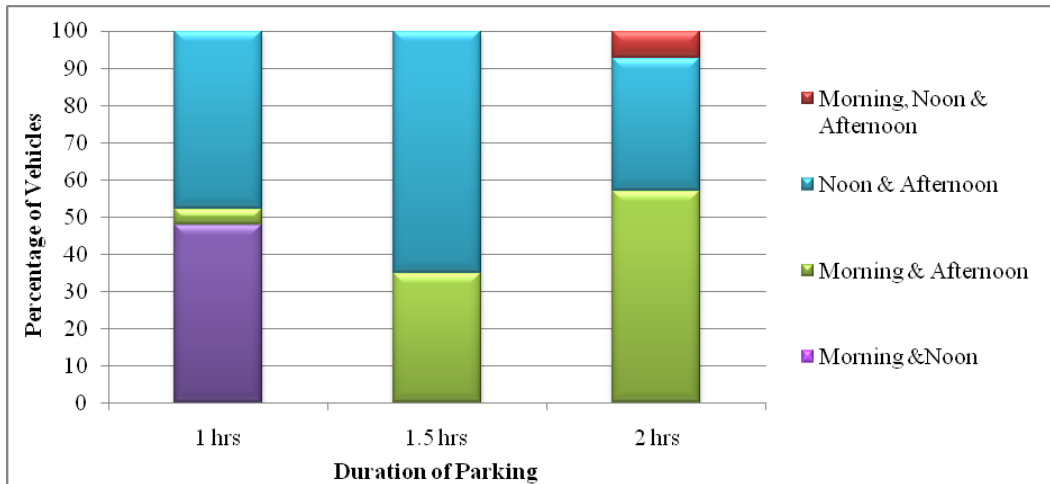


Figure 3: Distribution of Discontinuous Number of Short Duration Parking of Motijheel Area (Dainik Bangla-Shapla Square); Source: Field Survey, 2011

The discontinuous short duration (1- 2 hours) parking over time period is shown in figure 3. From noon to afternoon the discontinuation of parking is seen high. 57.14% of two hours discontinuous parking vehicles are seen during morning and afternoon periods. It indicates that those vehicle owners have come to the area for long stay, as the vehicles are seen at the time of opening and closure of offices.

Expected Number of Vehicles to be Parked

Generally before designing the parking spaces, it is important to know the difference between parked vehicles and expected number of vehicles for the existing parking space.

$$\begin{aligned} \text{Expected Number of Vehicles} &= \frac{172 + 6}{2.2} * 0.85 \\ &= 398 \text{ vehicles} \end{aligned}$$

Total number of vehicles by patrol usage survey = 470 vehicles.

Difference from existing condition= (470-398) vehicles = 72 vehicles.

Spill Over

Spill over is useful to see the scenario of parking if more vehicles are parked than the available parking space in a specific point of time. When the parked vehicles are less than the available space, no spill over is considered. As there is more available parking space than required, there is no spill over between period 9:00 am to 2:00 pm. Maximum spill over is shown at 3:00 pm. In the

afternoon (3:00 pm – 4:30 pm), more vehicles are gathered to pick the people returning home and get parked. A significant amount of spill over is observed in this period.

Level of Service

The average road width from Dainik Bangla to Shapla Square is 46 feet including three lanes. Among them, one lane remains occupied for on-street parking purposes, reducing effective road width to 30 feet. The reduced width is one of the major reasons behind congestion in this area. To see the impact of reduced width, level of service has been checked. From Haque et al (2011) the existing traffic volume of the road (Dainik Bangla to Shapla Square) has been found 1587.2 PCU/hr. Now, by assuming 12' per lane width and a capacity of 1400 PCUs/hr for each lane (DITS, 1994), the change in capacity and corresponding level of service (LOS) has been found.

Although there is no change in level of services, the volume/capacity ratio has changed significantly (50%) due to on-street parking (Table 1). Hence, a considerable impact of on-street parking on the traffic flow is evident.

Table 1: Impact of On-Street Parking on Level of Service

Effective Road Width (feet)	No. of lane (assuming 12' per lane width)	Standard Capacity per lane (PCU)	Capacity (PCUs/hr)	Existing Volume (PCU/hr)	Volume to Capacity Ratio	LOS
30 (with parking)	2.50	1400	3500	1587.2	0.45	A
46 (without parking)	3.83	1400	5366.67	1587.2	0.30	A

Source: Field Survey, 2011

Parking Demand and Supply Analysis

To make any decision regarding parking issue at first the total parking demand need to be calculated accurately. By using the following equation, total demand over the day has been calculated which is 1041.5 vehicle-hour.

$$\text{Parking Demand} = \sum (\text{No. of time seen} * \text{No. of vehicles} * \text{Average time interval})$$

As from the field survey available parking space i.e capacity has been seen 172 space/hour. Again, supply has been calculated by multiplying capacity with the average duration (2.22 hours) of parking. It denotes that almost 385 vehicles can be parked over the day with available 172 spaces. The capacity is the actual provision of parking space whereas supply is the relative provision of parking spaces over a time.

Demand supply ratio has been calculated as 2.73 which mean total demand is 2.73 times greater than available supply over the day. It happens because of high occupancy rate of the vehicles.

Figure 5 demonstrates the difference between demand and supply at different time periods of the day. At morning (9.00-11.00 am) and noon (12.00-2.00 pm) demand is much lesser than available supply due to low parking load. But at afternoon (3.00-5.00 pm) the demand exceeds the existing supply.

As the demand supply ratio is high, average parking duration for each vehicle need to be shortened to 2.73 times in order to cope with the existing demand. Average parking duration (2.22 hours) has been divided by the ratio to get reduced parking duration that is 0.81 hours (49 minutes).

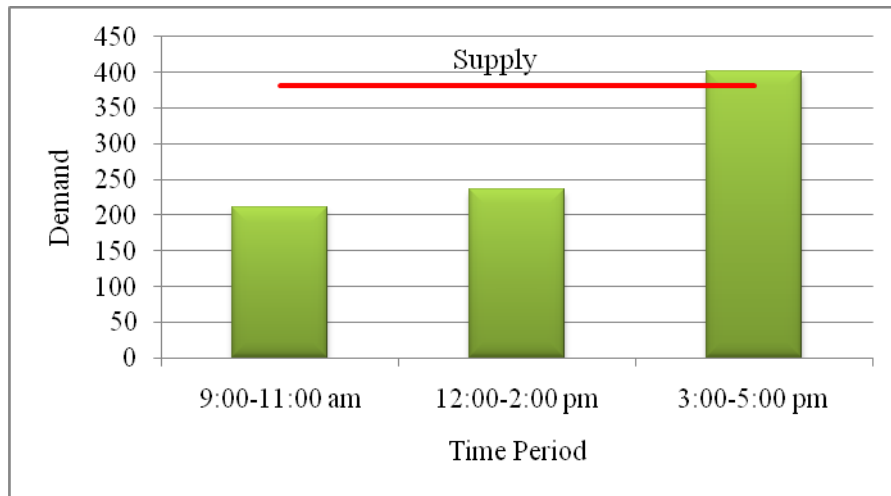


Figure 5: Comparison between Demand and Supply at Different Periods of Time; Source: Field Survey, 2011

Recommendations

1. Instead of high demand, there is no provision of parking charge system in this area. According to Parking Policy (2002), normal parking charges can be imposed on on-street parking. The patrol usage survey data shows that from 3:00 pm to 5:00 pm the parking load and parking demand exceeds the parking supply. To discourage parking in this period of time, charges may be doubled than other normal periods.
2. In section 2.3 it is seen that average parking duration need to be reduced from 2.22 hours to 49 minutes to fulfill the existing demand with available parking supply. This measure can be implemented by imposing charges on those vehicles occupying more than 49 minutes.
3. Fourteen buildings have unmarked on-street parking bays which should be marked in order to prevent haphazard parking.
4. Parking bays in front of Rupali Bank, Janata Bank, Birds Bangladesh, UCB Bank and Globe Chamber are used for both perpendicular and parallel parking in more than one row which reduce the effective road width of the route. This type of parking should be rearranged in an orderly manner.
5. If the marked parking throughout the road can be rearranged with 60° line marking in spite of 45°, supply will increase to 16% and demand supply ratio will be improved by 14%. Again, 60° parking will not reduce the effective road width enormously like perpendicular parking will do.

Conclusion

Motijheel is the center of all commercial activities of the city. But this part of the city is facing numerous traffic related problems. Parking is one of them which are contributing to severe congestion in this area. Some conclusions have been reached in the course of the study of parking in this area. No parking regulatory system and parking charges are applied for parking service and

absence of markings is worsening the situation. Moreover, there is a parking shortage in the study area as evidenced by the parking accumulation studies and also by demand-supply analysis. It is now high time to pay special concern for solving the parking problem of Motijheel commercial area.

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