

Traffic Pattern Analysis of an Urban Area: A Case Study of Pabna Municipality in Bangladesh

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Abstract

The study is conducted to explore the temporal and spatial variations of traffic pattern of Pabna Municipality based on data from field survey. Traffic Volume survey, Origin and Destination survey (O-D) and Household Interview survey (HIS) are the main methodological approaches for collecting data. The analysis of the data shows that the traffic flow is heavy during the peak hour and most of the trips are made by rickshaw, auto rickshaw and CNG in the selected study area. The result also indicates that the home based work trips (25.1%) contribute higher among the different trip purposes and the maximum trips are produced from higher income group. It tries to make the relationship among economic activities, transportation facilities, average monthly income and traffic pattern of the town. This study state the effects of these variables on traffic pattern to support the future planning of sustainable traffic management strategies for municipalities with similar profiles.

Keywords: *Transportation Management, Traffic Pattern, Transportation Facilities, Correlation.*

1 Introduction

For demographic, economic, land use and international development transport activities has increased which is essential for the economic and social growth of a country (MinVenW, 2004). Although transport has a remarkable impact on the development of urban economy as well as nation's economy, it has also much negative effectiveness such as traffic congestion and environmental pollution (Osoba and Samson, 2012). As a result "How to ease traffic jams almost becomes a hard nut to crack in each nation" (Wenhuan *et al.*, 2008). Therefore, many measures like new infrastructure constructions, traffic management measures, land use policies and traffic behavior measures are conducted to provide a fluent transport system with minimizing these negative sides (Weijermars, 2006). But the choice of right measures may bearguable. On the other hand, the capability of taking the appropriate measure develops through getting at the functioning of traffic system. In order to understand the functioning of traffic movement, traffic pattern analysis can be carried out as the most effective tool which includes many issues like accessibility, environment and safety (Taylor *et al.*, 1996). Besides, travel time is also granted as an important issue (MinVenW, 2004).

Traffic pattern has tremendously changed over the age around the world. Aderamo (2012) opined that rapid urbanization and population growth in cities are responsible for these changes (Ogunleye, 2015). In developing countries urban migration is increasing so rapidly which creates pressure on traffic flow. According to Gwillian (2011), per year about 3 to 5 percent population growth has occurred over the past decade in African cities due to urban migration (Ogunleye, 2015). The scenario is almost same for every developing country. For the over plus population public transportation for the mobility of people, goods and services are increasing in urban areas which contributes on congestion and changes traffic pattern. In general, traffic pattern analysis deals with trip generation, trip distribution, mode of trip, purpose of trip, modal spilt and travel time. It provides the information about traffic variation with respect to time, traffic attractive zones of a city and economic, social and cultural

impact on trip generation. This information is necessary in getting at the functioning of traffic system as well as in providing sufficient transport facilities in an urban area.

Traffic congestion is alarmingly becoming a daily occurrence in Pabna town. Residents have to suffer a lot due to traffic jam. It injures the residents economically and spoils their time. This study tries to expose the temporal and spatial variation of traffic pattern of Pabna municipality to reveal the factors behind present traffic congestion problem in the city. The main focus of the study is to have insight into the existing transport system thoroughly among wards of Pabna municipality and thus helps in realizing solutions blending their various applications.

2 Methodology of the Study

The study analyzes the traffic pattern of ward no. 05, 07 and 11 under the Pabna Municipality is selected as a study area. To obtain study objective spatial and temporal pattern of traffic flow are critically assessed. At first, three wards are selected including the major part of Pabna Municipality where the traffic flow is very high. There were observed that traffic generation and distribution in these wards is heavy because it covers maximum mixed land use zone (i.e. residential, commercial, administrative buildings, educational institutions, etc.). Ward-

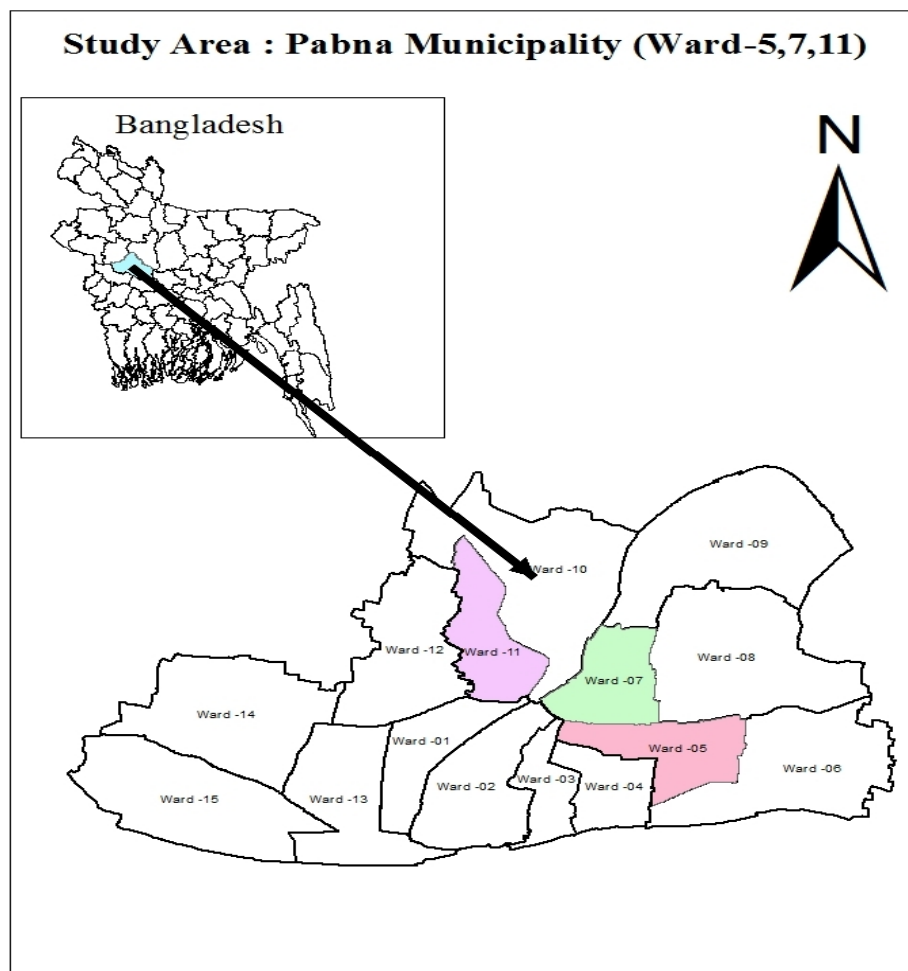


Figure 1. Location of Study Area

05 include the localities of Raghobpur Purba, Shibrampur Unit. Salgaria Paschim is the locality under ward-07. The localities of ward-11 are Pailanpur (part) and Radhanagar (part). The total number of households under ward-05 is 2088 while the numbers for ward-07 and 11 are 2179 and 3022 respectively. For the time and financial restrictions 2% of total households of each ward are sampled for survey.

To conduct the study, two types of data are used: primary data and secondary data. Primary data sources are:

- i. Reconnaissance survey and Traffic volume survey
- ii. Household Interview survey (HIS). HIS was conducted by questionnaire in direct observations and interviews. Personal observations and interviews were conducted to figure out and to supplement the data on the questionnaires.
- iii. O-D survey: Traffic movement patterns are signified as origin of trips and destination of the trips.

Secondary data are collected from Journals, books, Pabna Municipality, etc. The collected data were analyzed using various techniques or tools such as GIS (Geographic Information System) software, MS Excel and SPSS. The analysis revealed that trips are generated mainly for education purpose and household shopping purpose.

3 Data Analysis and Findings

3.1 Temporal Variation

To find out the temporal variation of traffic flow the most three important sections (e.g. Kheyaghat morr, Traffic morr and Indira morr) of Pabna city are surveyed to get traffic volume data. The traffic acute is observed from 8am to 10am before noon and 4pm to 7pm in after noon. The survey also finds that severe traffic congestion occurs during peak hours. Others congestion places are in front of Edward College, in front of Judge court, in front General Hospital, Masum Bazar on PN road, Library Bazar and in front of Bus Terminal. Lack of traffic regulations, insufficient manpower of related authorities, zigzag flow, lack of available footpath and parking facilities, temporary shops on footpath are observed as the main reasons of traffic congestion in the city.

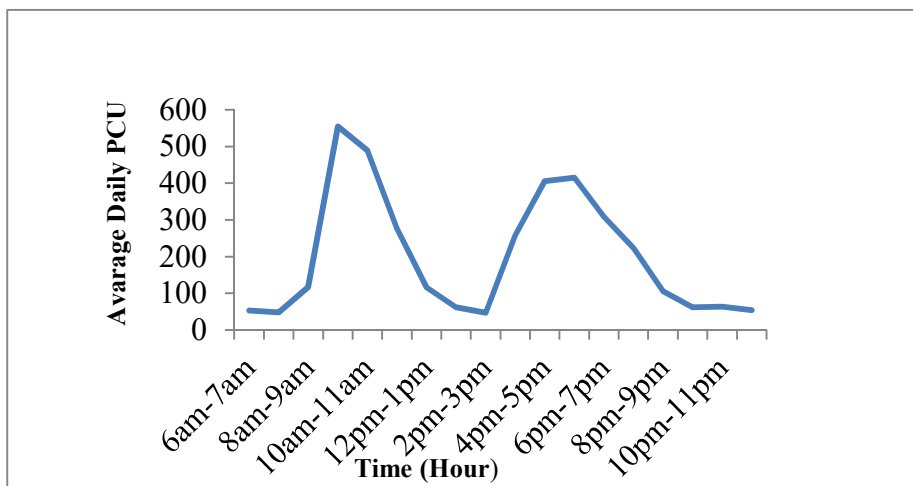


Figure 2. Temporal variation of traffic flow in Pabna Municipality

3.2 Spatial Variation

Spatial variation of traffic flow includes ward to ward traffic generation and distribution. To find out spatial variation of traffic flow within Pabna Municipality Household Interview Survey (HIS) is conducted in three selected wards (e.g. ward no-05, 07 and 11).

The survey also finds that 132 numbers of trips are generated from ward no-05, 134 from ward no-07 and 158 from ward no-11. The same numbers of trips are also attracted by the wards respectively. From the Table-1, it is observed that the total number of trips is 264 for ward no-05, 268 for ward no-07 and 316 for ward no-11.

Table 1. O-D Matrix in the study area

	Destination in different Zones															Total Trip Generation	
	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Ward 8	Ward 9	Ward 10	Ward 11	Ward 12	Ward 13	Ward 14	Ward 15		

Ward 1					-		-				2					
Ward 2					38		51				102					
Ward 3					33		-				-					
Ward 4					15		1				-					
Ward 5	-	38	33	15	5	6	13	4	2	4	3	4	1	4	-	132
Ward 6					6		-				-					
Ward 7	-	51	-	1	13	-	19	5	14	7	15	1	3	5	-	134
Ward 8					4		5				14					
Ward 9					2		14				-					
Ward 10					4		7				16					
Ward 11	2	102	-	-	3	-	15	14	-	16	2	4	1	-	3	158
Ward 12					4		1				4					
Ward 13					1		3				1					
Ward 14					4		5				-					
Ward 15					-		-				3					
Total Trips Attraction					132		134				158					

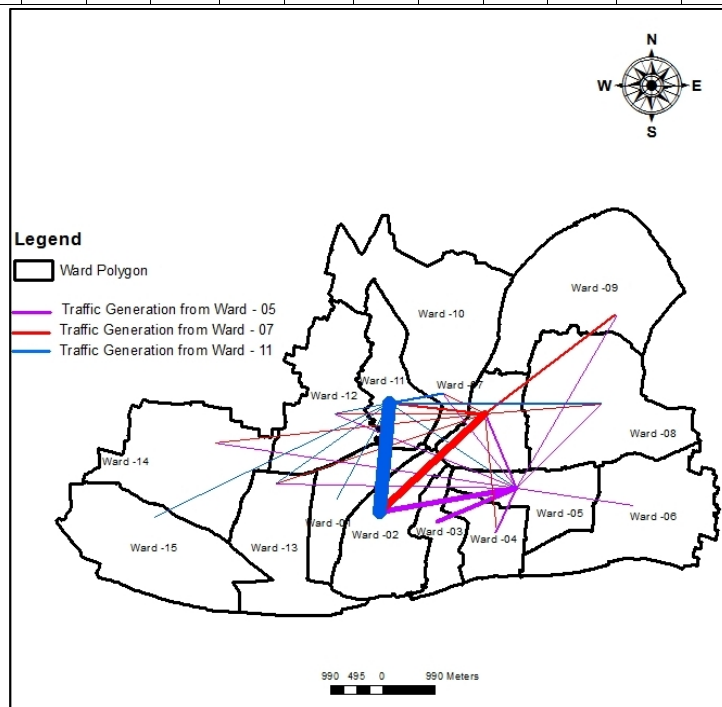


Figure 3. Traffic movement among wards

The survey also reveals that in ward no-05 about 70% of daily trips are made by rickshaw/auto rickshaw/CNG, 20.5% by motor cycle and 9.5% by bicycle while in ward no-07 about 68.2% of daily trips are made by rickshaw/auto rickshaw/CNG, 6.7% by motor cycle, 10.1% by bicycle and 15% by others (e.g. van). In ward no-11 out of total daily trips 66.5% is made by rickshaw/auto rickshaw/CNG, 16.8% by motor cycle, 7.6% by bicycle, 0.6% by car, 0.3% by microbus, 2.2% by bus and 6% by others (e.g. van).

A survey conducted in 2008 revealed that average journey time within Paurashava area is around 20 minutes and 69% of all trips are related to either home or work, leaving another 15% which are made to schools and college. (MIDP, 2008).

However, the study exposes that 25% of all trips are related for educational purpose, 25.1% for house-work, 16.7% for office, 12.2% for business, 8.5% for personal work, 4.7% for recreation, 4.2% for shopping and 3.6% for other purposes. Among all trip purposes maximum trips are made by rickshaw/auto rickshaw/CNG.

Table 2. Traffic Mode using scenarios of the study area

Purpose of Trip	Percentage of total Trip	Traffic Mode based on Trip Purpose (Percentage)						
		Rickshaw/ Auto Rickshaw/ CNG	Motor Cycle	Bicycle	Microbus	Car	Bus	Other
Office	16.7	55.6	28.9	7.1	0	0	1.4	7.1
Business	12.2	52.4	35	3.9	0	0	0	8.7
Shopping	4.2	91.7	5.5	2.8	0	0	0	0
Education	25.0	66.5	6.1	14.6	0.5	0.5	0.5	11.3
Recreation	4.7	82.5	12.5	2.5	0	2.5	0	0
Personal Work	8.5	66.7	22.2	9.7	0	0	0	1.4
House-work	25.1	79.8	3.3	9.9	0	0	0	6.1
Others	3.6	63.3	16.7	10	0	0	13.3	3.3

The study discovers that maximum trips are respected to urban utilities and high householder income, more schooling, large family size and more income person for a family has a positive relationship with trip generation. During different religious and cultural festival acute trip generation is also noticed.

The study also traces that the most trip attractive land uses are Shibrampur GPS, Shahid Fazlul Haque Poura High School, Christian graveyard, Pabna sadar graveyard and Bulbul College in ward no-05; Square Company, Sadar Thana, Ashok GPS, Ichamoti Clinic, Central girls school, Jalal Memorial Hospital, PDC hospital, Food storehouse, Blue bird KG school, Pathfinder KG school in ward no-07; BADC office, DPHE office, District forest office, Petrobangla gas company, BRDB office, Power Development Board office in ward no-11.

4 Conclusion

From the above discussion, the study can be concluded as follows:

- ✓ The present traffic pattern of Pabna town is critically analyzed and it is not satisfactory.
- ✓ Traffic Pattern of the city is largely influenced by its education and household system. Considerable effects of service and business also exist.
- ✓ These undoubtedly indicate that in order to reduce the present daily traffic congestion geometric design and expansion of roads will not be enough while topographic and land constraints are on existence.

- ✓ Therefore, these factors would have to bring under consideration for preparing a sustainable transportation plan as well as for providing fluent traffic movement system within cities like Pabna.

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