Analysis of Capacity Volume Study of Selected Highway of Bangladesh

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ABSTRACT

Dhaka-Sylhet highway is one of the most important transportation highways in Bangladesh. The pressure of additional vehicle is increasing at an alarming rate on this highway. The main focus of our paper is to study the present traffic volume scenario of that highway. The purpose of the study is to determine the traffic volume capacity, percentage rate of different types of vehicle and directional distribution of the Dhaka-Sylhet highway. The study has been done into four parts: investigation of the roads and lanes, determination of the existing condition of the highway, collection of the traffic data and finally analyzing of the data we found. From our study it has been seen that the main vehicle percentage of that highway is truck. We also found that volume of the traffic in Sylhet-Dhaka route is greater than that of in the Dhaka-Sylhet route.

Keyword : - *Traffic Capacity, Traffic Flow, Directional Distribution, Traffic Characteristics, Level-of-service*

1. INTRODUCTION

The Dhaka-Sylhet highway is one of the important Asian highway in Bangladesh, which is now a 2- lane one, will be elevated to 4-lane soon. One of the most critical needs in traffic engineering is a clear understanding of how much traffic a given facility can accommodate and under what operating conditions. The basic for all capacity and level-of-service analysis is a set of analytic procedures that relate demand or existing flow levels, geometric characteristics, and controls to measures of the resulting quality of operations.

Highway Capacity is the ability of road to accommodate traffic volume. It is the maximum hourly rate at which vehicles can reasonably be expected to cross a point on a roadway during a given time period under prevailing traffic roadway and control condition.

The Dhaka-Sylhet highway in the most important transportation highway in Bangladesh, accounting for 16 percent of the area of the country, 50 percent of the population, 57 percent of the nation's import-export flows. Sylhet port handles about 90 percent of the countries overseas traffic. It is so important for the country that it should be considered a national highway according to the consensus of the stake holder workshop.

Shamsul Haque (2013) investigates the traffic flow characteristics of Dhaka-Sylhet highway of Bangladesh. They found that Thursday produce maximum number of large bus and medium truck traffic and Friday produce maximum number of light vehicle traffic. In case of weekly traffic flow, there is a trend of increasing traffic slightly in second and third week of a month, and the first and fourth week of the month traffic decrease same way.

1.1 Objective of the study:

The main objective of the study is to determine the traffic capacity, vehicle percentage and directional distribution of the Dhaka-Sylhet highway. The main purpose of this study is to understand the traffic flow characteristics of Dhaka-Sylhet highway.

Fig-1: Study Area

1.2 Literature Review:

Shamsul Haque performed studies on traffic flow characteristics of Dhaka-Sylhet highway of Bangladesh in 2013 [1]. They identified weekly and monthly traffic flow variations, traffic growth pattern and heavy vehicle percentage. In their paper they found that in Dhaka-Sylhet highway, the highest average percentage of Bus/Truck/Covered Truck 2 axle from 2007 to 2009 is 42.46% in the traffic stream and the daily directional distribution is varied from around 47% to 53% and the average growth rate of total traffic has been found to be 23.79% per annum.

Ahad Ullah (2015), performed studies on traffic growth factors in three major highways of Bangladesh [2]. They found that traffic growth factor in Dhaka-Sylhet highway is 23.79%.

From Kachpur of Narayanganj district to Bodikona roundabout of Sylhet district - the 225 km of Dhaka Sylhet Highway passes through 7 districts namely Narayanganj, Norshindi, Kishoreganj, B.baria, Habiganj, Moulvibazaar and Sylhet. The road has many locations where accidents occurred repeatedly as reported in NRSSAP, 2002 – 2004.

The Dhaka-Sylhet Highway presently being developed as a most modern highway is already seriously affected by road accident. After the on going widening and reconstruction work, the highway is expected to be a scene of high speed and increased motorised traffic. This will expose the local road users particularly pedestrians to more accident risks. The civil work of Dhaka Sylhet Highway Project therefore, includes provision of road safety engineering measures like footpath, bus-bay, traffic signs, road marking, drainages etc at important growth centres to reduce road accident and ensure unhindered traffic flow. But lack of road safety knowledge and of using these facilities particularly by pedestrians and drivers added with encroachment of road and roadside by hawkers, shops and markets are being viewed to be the major road management problem in future. And hence is the urgency of an effective road safety public awareness campaign.

2. MATERIALS AND METHODS

The Study we have been done that divided into four parts. First investigation of the roads and lanes. Second get knowledge and information about the roads and lanes. Third the traffic data at specific route. Fourth collecting all the data and calculate all of them using a face to face technique and video recording, imperial data were collected for the study by sample survey method.

Observers must be positioned where we have a clear view of the traffic. Observers should be positioned away from the edge of the roadway. It observers are positioned above ground level and clear of obstructions we usually have the best vantage point. Visual contract must be maintained if there are multiple observers at a site. If views are unobstructed, observers may count from inside a vehicle. Tarabo rupgonjlane is our selected area.

The Tarabo Rupgonj lane was been choose for study. To get the best position for vehicle recording related to the visibility of the approach to be surveyed of the stop line and the signal. And to see whether the study can hamper pedestrian and other local activates, if so then changing the recording position. To fix the best suitable location for video recording to cover discharge process and best time for data collection (Pick hour).The recorded video was observed thoroughly to get a clear view of the pattern of queue formation, the vehicle performance and their behavior. The volume of all traffic is been calculated properly by manual counting method from the recorded video. Capacity analysis of this lane is done after getting traffic volume, which is done after getting traffic volumes.

Fig-2: Tarabo Rupgonj Lane

3. RESULTS

Capacity is a central concept in the design of roads and traffic control. It is desirable to be able to predict the times and places where congestion occurs , the amount of delay involved ,and the volume of traffic expected in bottom necks .

$$\text{Capacity} = \frac{1000V}{S}$$

Where,

C = Capacity in vehicle per hour.

V = Average journey speed in K.P.H.

S = Average spacing in meter of moving vehicles.

and $V = \dfrac{d}{t}$

d = total distance

In traffic engineering, the degree of saturation of an intersection or road is a measure of how much demand it is experiencing compared to its total capacity.

$$\text{Degree of Saturation} = \frac{V}{C}$$

Where,

V = Volume

C = Capacity

Classified vehicle count data for Tarabo Rupgonj of Dhaka City has been collected at video tape recording method of an hour. After sampling final data are presented in this chapter.

The following PCU values were used:

Type of vehicle	PCU
Bus	2.5
Truck	3.0
Car	1.0
Pick-up	2.0
CNG	0.75
Motor Bike	0.5
Bi-cycle	0.5

Table-1: Total volume Calculation of Dhaka to Sylhet highway

Vehicles Type	No. of Vehicle	PCU Value	No. of Vehicles X PCU	% of Volume	PCU/hr
Bus	52	2.5	130	9.96	130
Truck	130	3.0	390	24.90	390

Car	106	1.0	106	20.31	106
Pick-up	82	2.0	164	15.71	164
CNG	20	0.75	15	3.83	15
Motor-bike	42	0.5	21	8.04	21
Bicycle	0	0.5	0	0	0
Total	412		826		

In fig 3 vehicle percentage of Dhaka to Sylhet highway is shown. From the pi chart we can see that number of percentage of heavy truck (30%) is greater than any other types of vehicle.
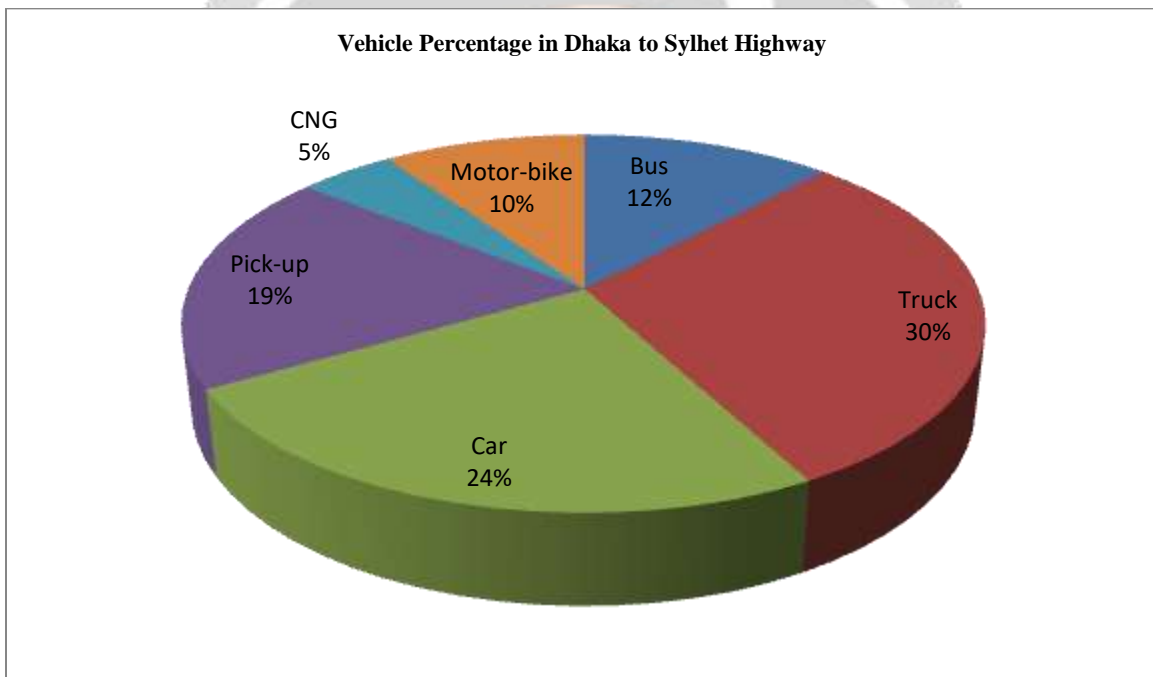
Fig-3: Vehicle Percentage in Dhaka to Sylhet Highway
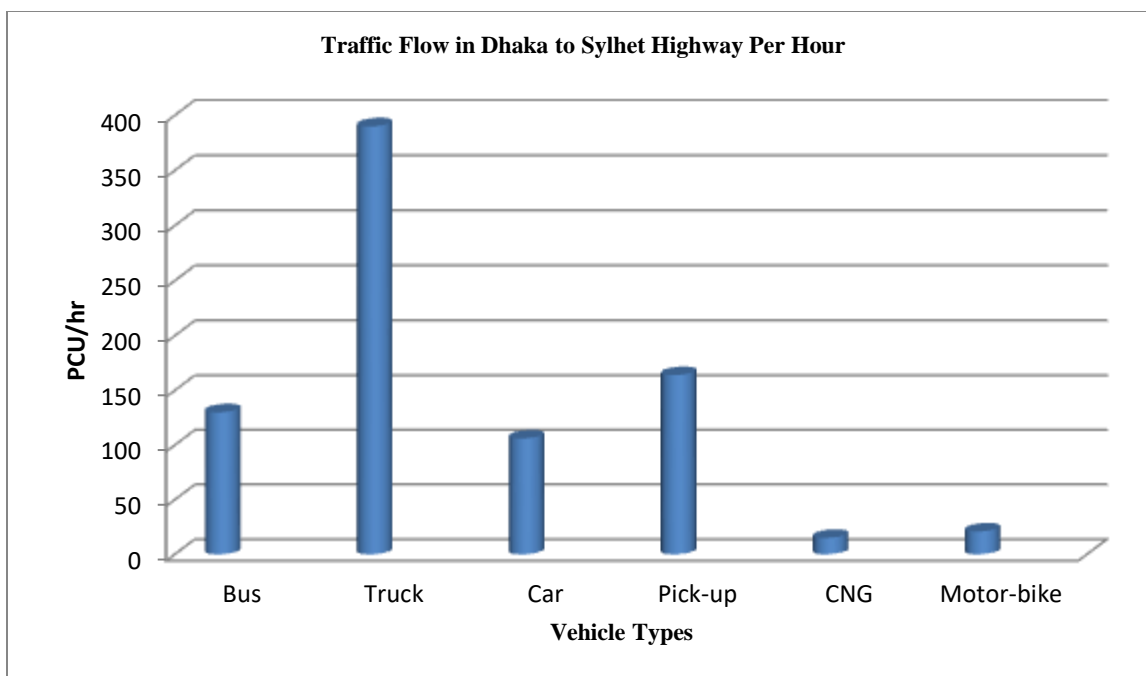
Fig-4: Traffic Flow in Dhaka to Sylhet Highway Per Hour

From fig 4 it can be seen that in Dhaka to Sylhet highway number of truck is maximum than any other types of vehicle and the number of CNG is minimum than any other type of vehicle per hour. This analysis states that most of the vehicle on that direction is heavy truck.

Table-2: Total volume Calculation of Sylhet To Dhaka Highway

Vehicles Type	No. of Vehicle	PCU Value	No. of Vehicles X PCU	% of Volume	PCU/hr
Bus	80	2.5	200	12.68	200
Truck	114	3.0	342	18.07	342
Car	104	1.0	104	16.48	104
Pick-up	164	2.0	328	25.99	328
CNG	38	0.75	28.5	6.02	28.5

Motor-bike	49	0.5	24.5	7.77	24.5
Bicycle	0	0.5	0	0	0
Total	**549**		**1027**		

In fig 5 vehicle percentage of Sylhet to Dhaka highway is shown. From the pi chart we can see that number of percentage of pick up (30%) is greater than any other types of vehicle.
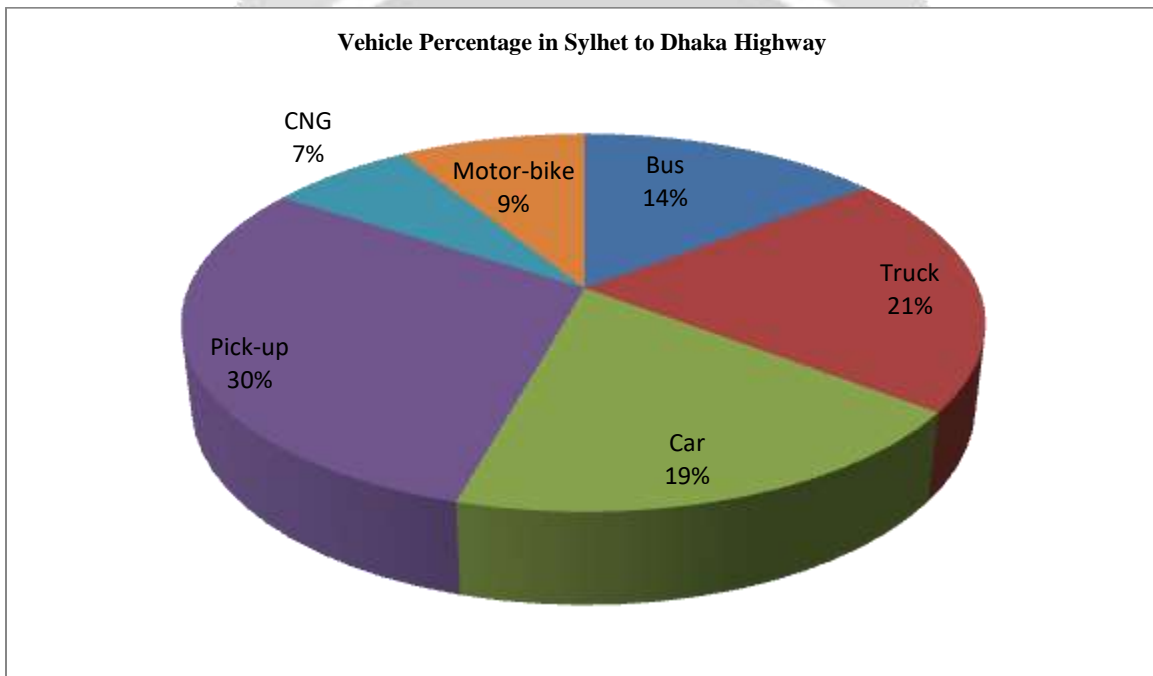

Fig-5: Vehicle Percentage in Sylhet to Dhaka Highway

From fig 6 it can be seen that in Sylhet to Dhaka highway number of truck and pick up is maximum than any other types of vehicle and the number of motor bike is minimum than any other type of vehicle per hour. This analysis states that most of the vehicle on that direction is heavy truck.
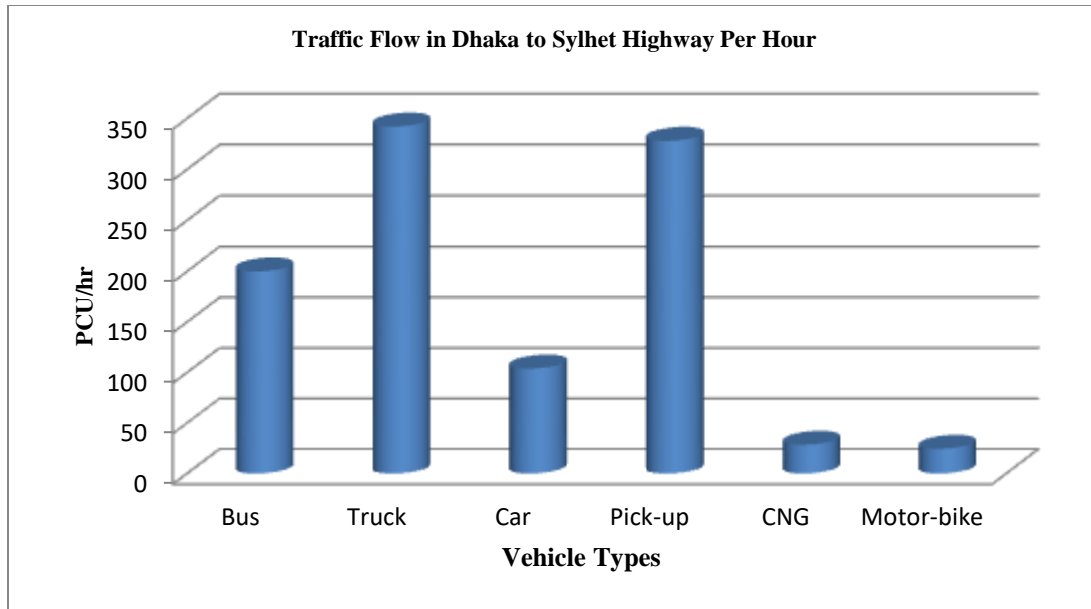
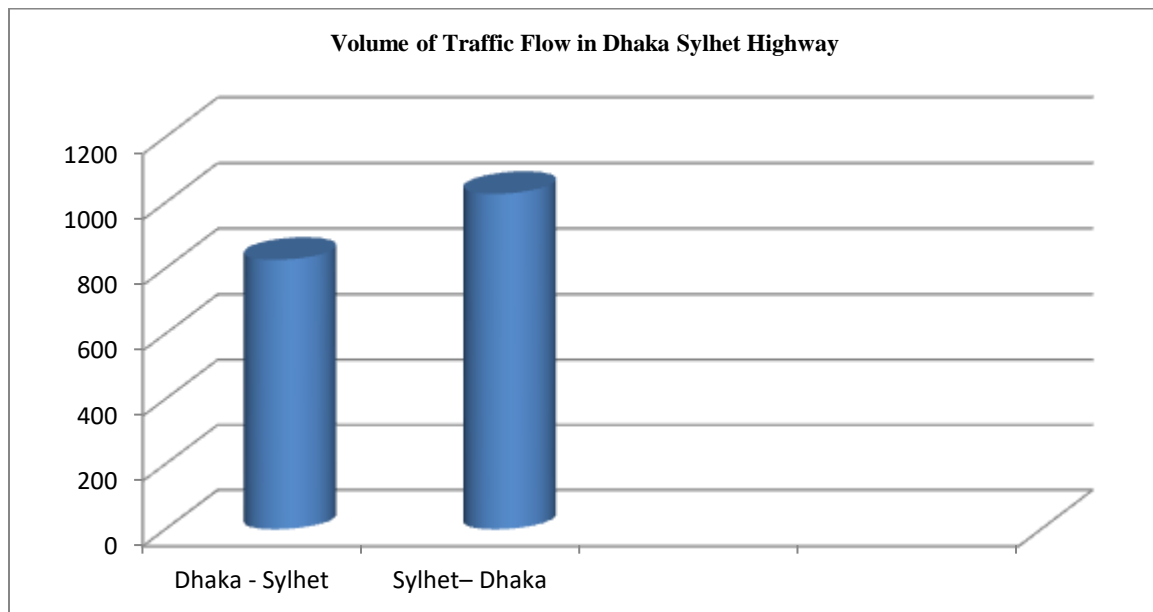**Fig-6:** Traffic Flow in Sylhet to Dhaka Highway Per Hour
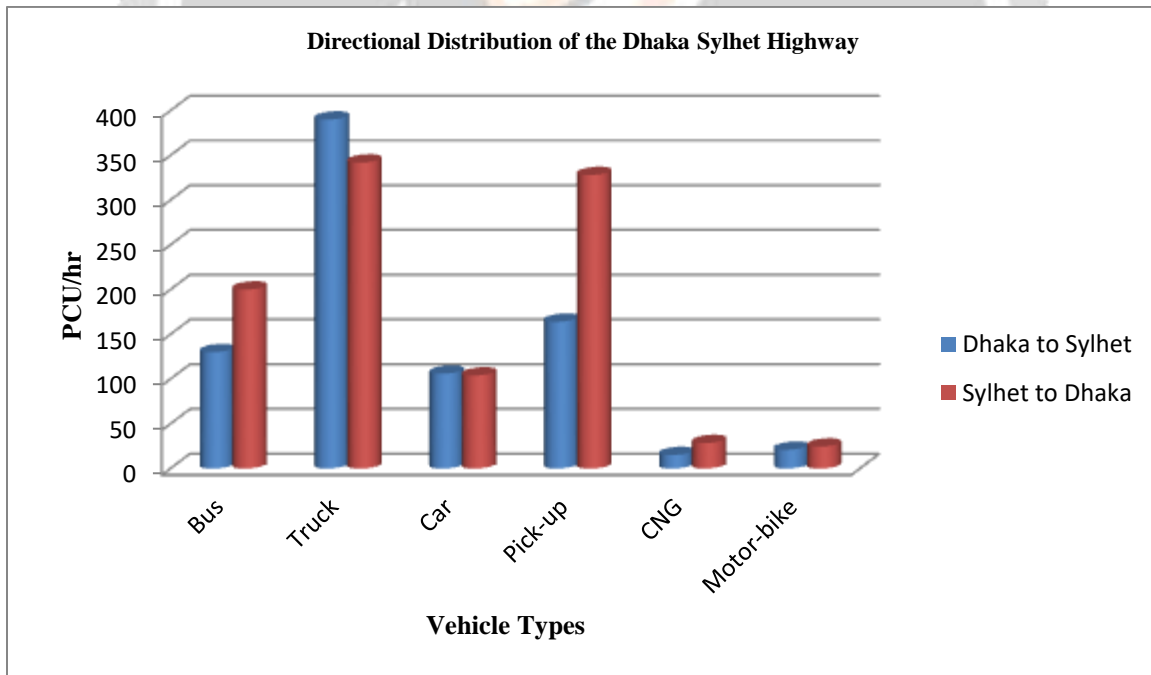
Fig-7: Directional Distribution of the Dhaka Sylhet Highway Per Hour

From fig 7 we can see that in Dhaka to Sylhet direction maximum vehicle flow per hour is heavy truck. On the other hand in Sylhet to Dhaka direction maximum vehicle flow is heavy truck, although number of pick up is also in the high percentage. In the peak hour most of the vehicles in that highway is heavy truck.

Table-3: Capacity Analysis

Selected Highway	Study Area	Volume	Effective Capacity	Degree of Saturation V/C
Dhaka - Sylhet	Tarabo rupgonj Lane	826	2620.95	0.315
Sylhet– Dhaka		1027		0.392

Fig-8: Volume of Traffic Flow in Dhaka Sylhet Highway

From fig 8 we can easily see that traffic volume in Dhaka-Sylhet highway is less than that in Sylhet-Dhaka highway.

4. CONCLUSIONS

Most road projects today involve modifications to existing roadways, and the planning, operation, and maintenance of such projects often are opportunities for improving ecological conditions. A growing body of information describes such practices for improving aquatic and terrestrial

This is the biggest roar of the country as it joins the two largest business, education cultural, trade ,diplomatic and strategic centers of the country . It joins the country's largest sea port with the capital.

Our study area is Tarabo rupgonj lane . After study we estimate the 1 hr traffic volume, capacity and degree of saturation . For study and collecting data we use video camera method for traffic counting . At Dhaka – Sylhet road we estimate 1 hr volumes are 826 and 1027, capacity is 2620.95 and degree of saturation's are 0.315 and 0.392. Our volume is bigger than capacity . So the capacity should be increased.

Number of sites should be increased so that a model can be established relating affecting pcu values . Day to day variations of a particular site can be determined. Several data during peak hours for each site should have produces more reliable results . For better result data should be collected at different times of the day at a selected site . Vehicles should be classified in broader categories to reflect the variation in sizes on the capacity. It is expected that considerations of wide range of vehicle classes will produce more appropriate pcu values. More over other method can be apply.

The assessment of the cumulative impacts of road construction and use is seldom adequate. Although many laws, regulations, and policies require some consideration of ecological effects of transportation activities, such as road construction, the legal structure leaves substantial gaps in the requirements.

5. REFERENCES

[1]. .S Haque, M. Ahad, and H. Nikraz, Investigation Of Traffic Flow Characteristics Of Dhaka Sylhet Highway (N-2) Of Bangladesh, International Journal of Civil Engineering and Technology, 4(4), 2013, 55-65.

[2]. A Ullah, H. Nikraz and S. Haque, Comparison of Traffic Growth Factors in Three Major Highways of Bangladesh: A Case Study, Journal of Traffic and Transportation Engineering 3 (2015) 111-117.

[3]. B. Banik, M. Chowdhury, E. Hossain and B. Mojumdar, Road Accident and Safety Study in Sylhet Region of Bangladesh, Journal of Engineering Science and Technology, 6(4), 2011, 493-505.

[4]. M. Alam and H. Ahsan, Identification and Characterization of Hazardous Road Locations on Dhaka-Chittagong National Highway, Global Journal of Researches in Engineering General Engineering, 3(4), 2013.

[5]. A. Chowdhury, K. Kishi and K. Satoh, A Study on Highway Logistics Problem from Dhaka to Chittagong in Bangladesh, Japan Society of Civil Engineers.