TRAFFIC VOLUME STUDY OF THE ROAD PANTHAPATH TO RUSSEL SQUARE

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A thesis Submitted to the Department of Civil Engineering in Partial Fulfillment for the Degree of Bachelor of Science in Civil Engineering



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Section: 23 A+E
Semester: Fall 2024

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Semester Year: 2024

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DECLARATION

We hereby declare that this report is the result of our own work and effort and has not been submitted elsewhere for any award. All the contents provided here are based on our labor dedicated to the completion of the Roadway Condition Survey experiment. All sources of information used in this report have been acknowledged, and the necessary references have been included for further study.

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ACKNOWLEDGEMENTS

We would like to express our sincere gratitude to all those who contributed to the successful completion of this Traffic Volume Study.

First and foremost, I would like to thank our Supervisor, Angila Tabassum, for her constant guidance, support, and valuable insights throughout the study. Their expertise and encouragement have been crucial in shaping this report.

We would also like to extend our thanks to the local traffic authorities and officials for their cooperation in providing the necessary data and logistical support. Their assistance in allowing access to the study areas and providing real-time traffic data made this study possible.

A special thanks goes to the team responsible for traffic data collection, whose dedication and hard work ensured that accurate and comprehensive information was gathered. The use of automated traffic counters and manual observations was essential for obtaining relevant data.

We are also grateful to our friends for their moral support and constructive feedback throughout the course of this research.

Finally, we thank our families for their patience and understanding during the completion of this study.

ABSTRACT

The road from **Panthapath to Russel Square** is one of the busiest urban routes, connecting multiple key areas and serving a high volume of vehicles daily. This Traffic Volume Study aims to analyze the traffic flow, congestion patterns, and the effectiveness of the current infrastructure on this route. The study involved manual and automated traffic counting at key locations along the road during different time intervals, including both peak and off-peak hours. The results revealed that traffic volume significantly increases during morning and evening peak hours, with a noticeable concentration of passenger vehicles and two-wheelers. The study also identified congestion hotspots, particularly at intersections near Russel Square, and areas with a higher frequency of accidents. The findings suggest that the road's capacity is being exceeded, leading to significant delays, especially during rush hours. Based on the study, several recommendations are proposed, including road widening, improved traffic signal coordination, expansion of public transport, and the establishment of dedicated lanes for buses and cyclists. The implementation of these measures is expected to improve traffic flow, reduce congestion, and enhance overall road safety along this critical urban corridor.

Keywords: Volume, Traffic, Vehicles, Road.

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LIST OF ABBREBIATIONS

AADT – Annual Average Daily Traffic

ADT- Average Daily Traffic

DD – Directional Distribution

MEF- Monthly Expansion Factor

DEF- Daily Expansion Factor

HEF-Hourly Expansion Factor

CNG - Compressed Natural Gas

Chapter 1

Introduction

1.1 Background

The road from Panthapath to Russel Square serves as a primary route for commuters traveling between major urban hubs, commercial centers, and residential areas. Over the years, the traffic volume on this stretch has significantly increased due to rapid urbanization, commercial expansion, and the rise in private vehicle ownership. However, despite its importance, the existing infrastructure has struggled to accommodate the growing traffic demand, resulting in frequent congestion, delays, and reduced road safety.

A thorough traffic volume study is essential to understand the patterns of vehicle movement, peak hours, road utilization, and to identify congestion hotspots. Moreover, it will provide insights into the types of vehicles using the road and their impact on traffic flow, which can help policymakers and local authorities make informed decisions about potential improvements in road design, traffic management, and Public transportation systems.

1.2 Objective of the study

The objectives of the study can be divided into two categories. The general objective addresses how this study can be used to enhance roadways. Specific goals are linked to the analysis to be performed on the survey data.

1.2.1 General objective of the study

The general objectives of the study are as follows:

1. To identify existing problems
2. To measure traffic (vehicular traffic) volume.
3. To assess the operating situation of the roadway.
4. To identify possible solutions for improvement.
5. To aid transportation planning.

1.2.2 Specific objective of the study

The specific objectives of the traffic volume study are as follows:

1. To determine vehicle composition of traffic stream for each direction and show in a Pie-chart.
2. To determine the service flow rate in PCU/PCE unit for each direction.
3. To determine directional distribution.
4. To determine Peak hour flow (PHF).
5. To estimate average annual daily traffic, AADT is based on expansion factors.
6. To draw flow fluctuation curve.

1.3 Scope of the study:

These statistics are mostly utilized for road and roadway network design, planning, and improvement. This data is sometimes utilized by social scientists to undertake various social research.

1.4 Scope in design

The information gleaned from these investigations is employed in the structural and geometric design of the pavement. The structural design necessitates the repetition of wheel load. To determine design wheel repetition, AADT must be combined with traffic growth rate. To avoid congestion, the geometric design is based on peak hour volume. The volumetric data of traffic also influence the design of intersections, roundabouts, footpaths, street lights, signs and markings, and traffic signals

Chapter 2
Literature Review

2.1 Introduction

The purpose of this literature review is to provide a comprehensive overview of previous research, studies, and methodologies relevant to traffic volume analysis, congestion management, and urban road infrastructure. Traffic volume studies play a critical role in enhancing road safety, facilitating efficient traffic flow, and designing sustainable transportation networks. This section examines key concepts, theories, and findings from prior studies, which form the foundation of this research. Additionally, it explores common methodologies employed in traffic volume studies and congestion analysis, as well as the influence of infrastructure on urban traffic patterns.

2.2 Previous Research on Volume Study

Specifically, the literature on the impact of traffic volume, speed flow relationships, passenger car equivalents, peak hour factor, flow variations, traffic capacity, and level of serviceability is discussed in the present study, which focuses on the significance of traffic volume in traffic engineering of urban and suburban road links (LOS). But numerous investigations have contributed to the development and modification of the current study.

Here are only a few of them in brief:

Satyanarayana (2012) examined the impact of stream speed, traffic volume, and traffic type on passenger car equivalents. (Ref.-1) The PCU factors were developed using Chandra's method, and it was discovered that for two axle trucks, the PCU values increased as the compositional share of the relevant vehicle classes in the traffic stream increased. The compositional share of two-wheelers in the traffic stream has virtually little impact on their PCU. Various places in the range have different compositional shares of 2W of 31.69% to 34.23%, but only a 1.1% rise in PCU values, which may be related to the vehicle's great mobility. Bullock cart PCU values rise in slow moving traffic as the compositional share of the stream declines.

Arkatkar (2011) (Ref.-2) by utilizing the traffic-flow simulation software HETEROSIM, researchers examined the impact of changes in traffic volume, road width, the size of the improvement, and its length on PCU value. The simulation model's calibration and validation are based on field data on traffic flow characteristics.

The validated simulation model is then used to calculate PCU values for various vehicle kinds, and the results show that the model is capable of accurately simulating the heterogeneous traffic flow on mid-block sections of intercity roads under various road conditions.

V.T. Hamizh Arasan and Krishnamurthy (2008) explored the complexities of vehicular interaction in diverse traffic. (Ref.-03) The PCU estimations for the main categories of heterogeneous traffic vehicles, for a Wide range of traffic volume and road conditions show that a vehicle's PCU value changes dramatically with traffic volume and road width.

Basu D, Maitra S.R (2006) examined the relationship between Passenger Car Equivalency (PCE) and traffic volume and composition (Ref.-04). A method is shown to estimate PCE using the stream speed as the Measure of Equivalence (MOE). The decrease in stream speed brought on by a vehicle type's minor increase in traffic volume is contrasted with the decrease brought on by an old-technology car, which serves as the reference vehicle for PCE estimate. The study shows that both traffic volume and its composition have an impact on PCE. All vehicle classes have found that their PCE values raise as traffic volume rises, but large trucks are most affected. The compositional share of two-wheelers in the traffic stream essentially has no impact on PCE.

Ahmed Al-Kaisy (2005) (Ref.-05) attempting to determine passenger car equivalents for big vehicles under congestion after discovering that the HCM proposed PCU parameters for large vehicles are only valid during free-flow situations. Following a study of the literature, it was discovered that several research on the estimate of PCU values for cars in heterogeneous traffic had been carried out.

Chandra. S and Prasad N.V (2004) (Ref.-06) observed that there are significant differences in the PCU factors computed for various urban road sections. Physical, traffic, and traffic mix all affect capacity. A multilane divided urban road's capacity rises linearly as the percentage of two-wheelers in the traffic stream rises. According to estimates, an urban road section's capacity rises by around 9% for every 10% increase in the percentage of 2-wheelers. A segment with side friction has a capacity that is about 12% lower than a section without side friction.

Marwah and Bhuvanesh (2000) (Ref.-07) categorization level for urban traffic that is diverse indicated. To determine LOS, they took into account concentration, road occupancy, and motorized two-wheeler travel speeds, and car travel speeds.

As a way to measure traffic on urban highways, six (6) levels of services were proposed, with five (5) in a stable flow zone (the traditional LOS A to E region) and 1 representing the unstable flow (currently LOS F).

For road widths of 12 feet (lane), in one direction, they calculated capacity values for study locations on urban roadways as 2000 and 2200 PCU per hour per lane

2.3 Terms Relevant to the Study

Before delving into the specifics of this study, it is necessary to become acquainted with the terminologies associated with traffic flow characteristics and the computation of expansion factors or equations. As a result, the essential traffic flow parameters that are frequently employed in this study are summarized in this section.

• Traffic Volume: The number of vehicles passing a specific spot along a roadway or traffic lane per unit of time is referred to as traffic volume. Volume is a traffic flow metric that is frequently quantified in units of vehicles per hour, vehicles per day, and so on.

• ADT: ADT stands for Annual Daily Traffic and is defined as the average number of vehicles passing through a specific point during a period of more than one day but less than one year. It is calculated by dividing the total number of cars over a given time period by the number of days.

• AADT: The total number of vehicles passing a specific site over a one-year period is represented by average annual daily traffic. The AADT is a critical aspect in highway geometric design.

• Rate of flow: The equal hourly rate at which cars travel over a specific spot or segment of a lane or roadway in less than one hour, usually 15 minutes.

• Peak Hour Factor: The Peak Hour Factor is defined as the ratio of total hourly volume to a maximum rate of flow per hour.

• Directional Distribution: The percentage of traffic flow in one direction during a specific time of day is referred to as directional distribution. This issue is especially essential on commuter roads, where the most traffic flows in one direction in the morning and the other in the evening.This must also be considered for effective geometric design.

2.4 Summary

The traffic volume count data we see that a large number of private vehicles like Car, Motorcycle etc. use the Russel Square to Panthapath road more than the public vehicles like Bus. It is also seen that it is a busy link road with a high traffic volume. Not using of public transport is a main problem for traffic jam Panthapath to Russel Square is one of the busiest urban routes, connecting multiple key areas and serving a high volume of vehicles daily. the analysis it is clearly visible that the difference of ADT & AADT on these two directions is not that much high. So it can be clearly said that there remains more over equal rush on these directions.

Chapter 3

METHODOLOGY

3.1 Introduction

The methodology section outlines the approach, techniques, and tools used to conduct the **Traffic Volume Study** on the road stretch from **Panthapath to Russel Square**.The objective of this section to provide a clear and detailed description of how the data was collected, processed, and analyzed to achieve the goals set out in the research. To obtain accurate and reliable results, a combination of manual and automated data collection methods was employed, with a focus on capturing traffic volume, composition, peak traffic periods, and congestion levels.

3.2 Flow Chart of Work:

1. Problem Identification:

The first step involves identifying the specific issues and objectives for the traffic volume study, including the need to assess traffic flow, peak hour congestion, and infrastructure constraints.

2. Data Collection:

- Manual Counting: Manual surveys and traffic observation are carried out at strategic points along the road.
- Automated Traffic Counting: Automated systems (e.g., inductive loops, radar sensors)are installed at key locations for continuous data collection.

3. Data Processing & Analysis:

- The raw data collected is cleaned and organized, including eliminating any errors or inconsistencies.
- Analysis is performed to examine traffic patterns, hourly traffic volumes, and the relationship between vehicle types and overall traffic flow.

4. Peak Hour & Traffic Volume Analysis:

- The data is analyzed to identify peak traffic hours (morning, afternoon, evening), which are critical for understanding congestion levels
- Total traffic volume is calculated during different periods. `

5. Traffic Composition & Vehicle Categorization:

- Vehicles are categorized into different types, such as passenger vehicles, commercial vehicles, two-wheelers, and public transport, to understand their contribution to overall traffic.

6. Congestion & Accident Analysis:

- Areas of congestion are identified based on the traffic volume and flow.
- Accident data is analyzed to identify any high-risk zones and correlate them with peak traffic periods.

7. Recommendations:

- Based on the analysis, recommendations are made for improving road infrastructure, Traffic management practices, and the enhancement of public transport services.

3.3 Summary

After analysis the Panthapath to Russel Square is one of the busiest urban routes, connecting multiple key areas and serving a high volume of vehicles daily. including peak and off-peak hours .The traffic volume count is analyzed for Stream Flow Composition, Average Daily Traffic(ADT), Annual Average Daily Traffic (AADT), Directional Distribution of Vehicles. From the pie Diagram, it is seen that 62% vehicles of the total traffic volume travel from Russell Square to Pathapath direction (Russel Square to Panthapath) and 38% vehicles travel in the opposite direction**.**

Chapter 4

Data Collection & Analysis

4.1 Introduction

Data collection and analysis are integral components of any research or study aimed at understanding patterns , solving problems, or making informed decisions. This section provides a foundational overview of these processes, highlighting their significance, key methodologies, and their role in achieving the study's objectives.

4.2 Data collection Location

The survey is done on the link road located between Panthapath Intersection and Russel Square. Our group was at Russel Square at the entry point towards Russel Square to Panthapath which is shown in the next figure.

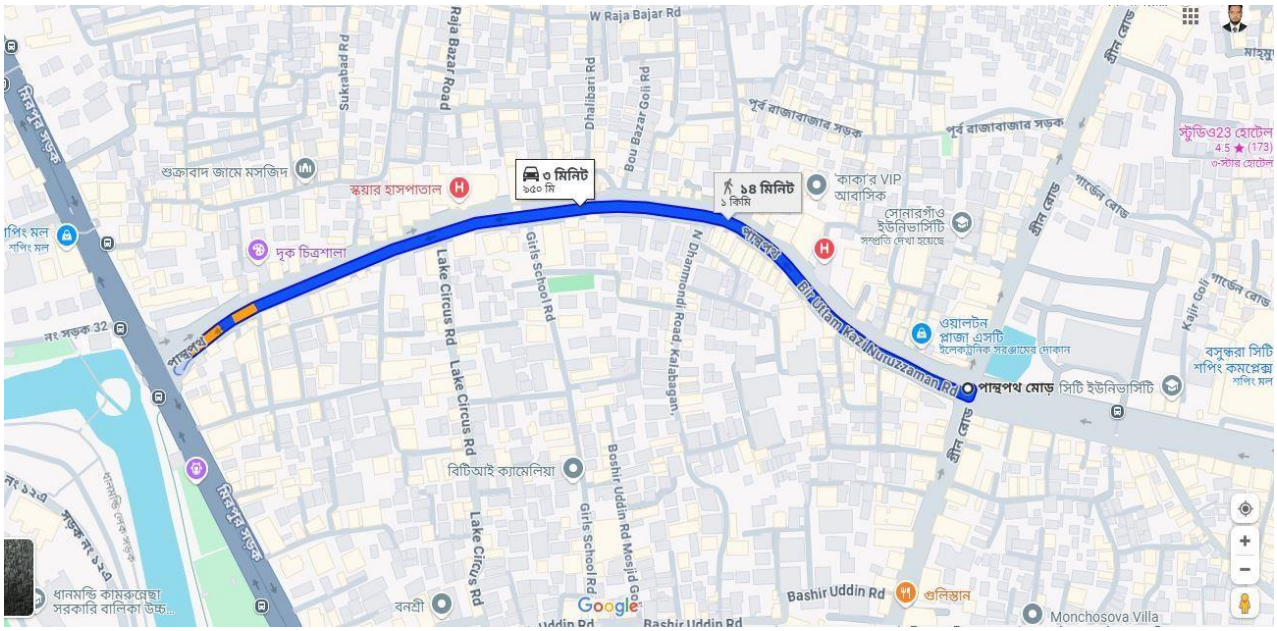


Figure 4.1: Survey Location (Source: Google Map)

4.3 Counting Period

Data is collected on 28 th November, 2024. Short count data is taken over 30 minutes and converted to hourly volume. Data collection time of different groups are shown in the following table

Time/Direction	**09:00-09:30 am**
Russel Square to Panthapath (Russel Sq. to Panthapath)	Our Group
Time/Direction	**3:00-3:30 PM**
Panthapath to Russel Square (Panthapath to Russel Sq.)	Our Group

Table 4-1: Counting Period

4.4 Weather Condition

The weather condition was favorable for volume study. The day was very shiny and the sky was clear. Temperature was 18° **C** ; Humidity was nearly 76%.

4.5 Data Collection Procedure

Whole surveying procedure can be subdivided into three categories:

1. Reconnaissance survey
2. Piloting
3. Final survey

4.5.1 Reconnaissance survey

The primary goal of a reconnaissance survey is to identify and eliminate routes or sites that are difficult or impractical while discovering routes or areas with greater potential. Upon arriving at he survey site, a reconnaissance survey was conducted for approximately 10 minutes. During this time, observations were made to determine the best methods for collecting data accurately.First, an appropriate area was selected, located about 20 meters away from the intersection. A visual assessment of the vehicle composition was then conducted, which helped determine the number of individuals needed to count each vehicle category.

4.5.2 Piloting

After all of the judgments had been made, another five minutes of piloting was performed to see if there was any sort of problem that had gone unnoticed during the reconnaissance step.

4.5.3 Final Survey

Following the completion of the preceding steps, the final survey began. For 30 minutes, 5 members recorded data in 5-minute intervals on a tally sheet. The data was then put together for additional analysis.

4.6 Collected Data

The collected data is shown in the following tables

.

4.6.1 Vehicle Classification

Vehicles were classified as follows

1	Bus (B)	All type of buses
2	Light Vehicle (LV)	Passenger car, taxi, microbus, jeep, pajero, utility vehicles, pickup, ambulance etc.
3	Auto rickshaw (AR)	Baby taxi, mishook, CNG.
4	Motor cycle (MC)	All type of motorized two-wheelers

Table 4-2: Vehicle Classification

Volume data were recorded by groups according to the above table

4.6.2 Data collected by Group

Data collected by group according to vehicle classification as mentioned in 4.6.1 are presented below.

Vehicle Composition							
Vehicle Type	**Interval (minutes)**						**Total No of Vehicles**
	0-5	**5-10**	**10-15**	**15-20**	**20-25**	**25-30**	
Bus	1	0	0	1	0	1	3
Light Vehicle	45	39	58	52	47	41	282
Auto Rickshaw	25	28	17	30	26	22	148
Motor Cycle	30	29	32	35	28	35	189
Total Vehicle(no)=							622

Table 4-3: Data collected by Group

4.6.3 Summary of collected data by groups

Total number of vehicles of five our groups are presented below.

Direction	**Russel Square to Panthapath**	**Panthapath to Russel Square**
Group	**our**	**our**
Time	**9:00-09:30pm**	**3:00-3:30am**
Vehicle Type		
Bus	5	3
Light Vehicle	480	282
Auto Rickshaw	246	148
Motor Cycle	290	189
Total Vehicle(no)	**1021**	**622**

Table 4-4: Summary of collected data by groups

4.7 Data Analysis

1. Vehicle Composition in the Traffic Stream

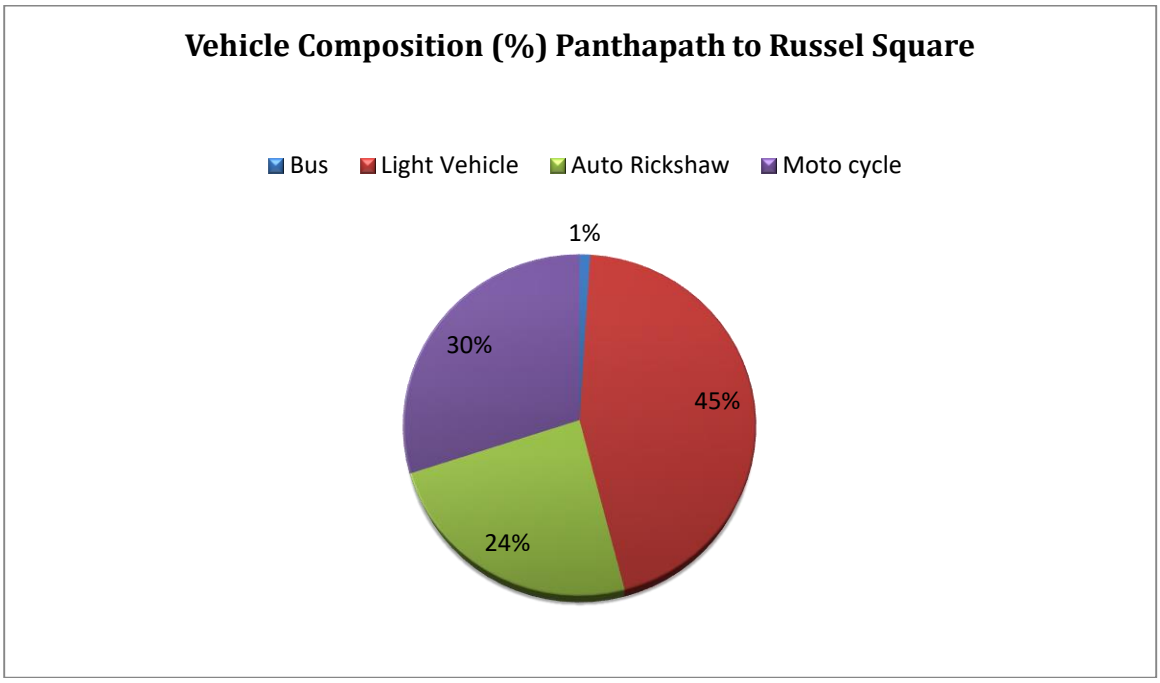


Figure 4-2: Pie Chart of Vehicle Composition (our Group), Panthapath to Russel Square

The following bar diagram represents the number of counted vehicle of group Panthapath to Russel Square.

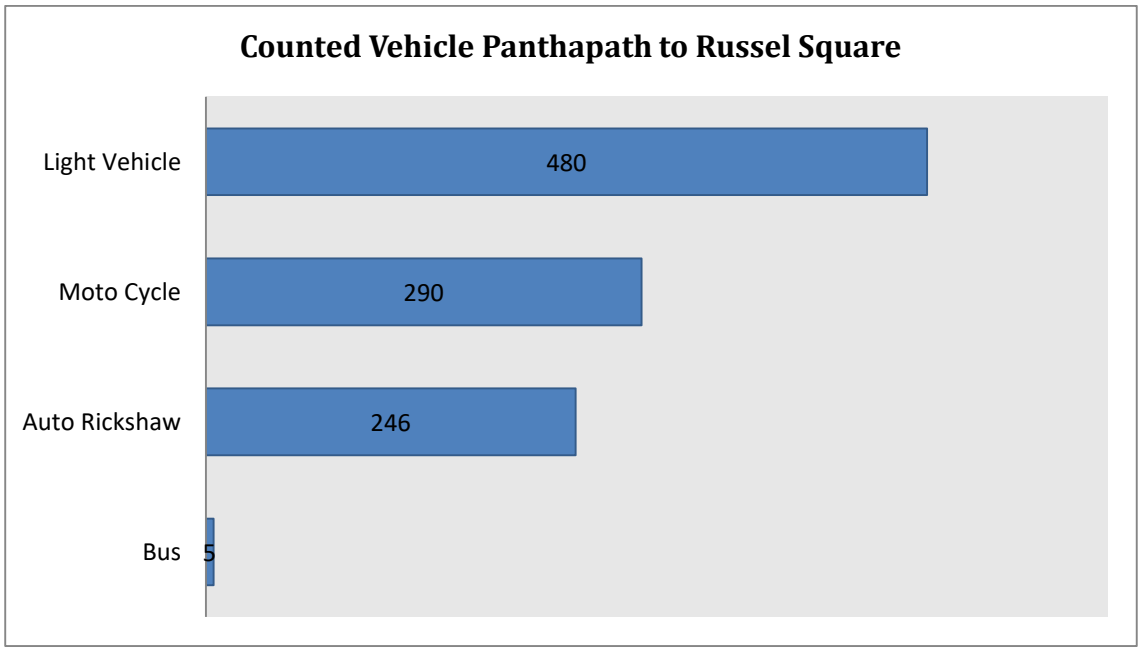


Figure 4-3: Bar diagram of counted vehicle (Panthapath to Russel Square)

Vehicle composition by group data (appendix) is presented in the following pie chart.

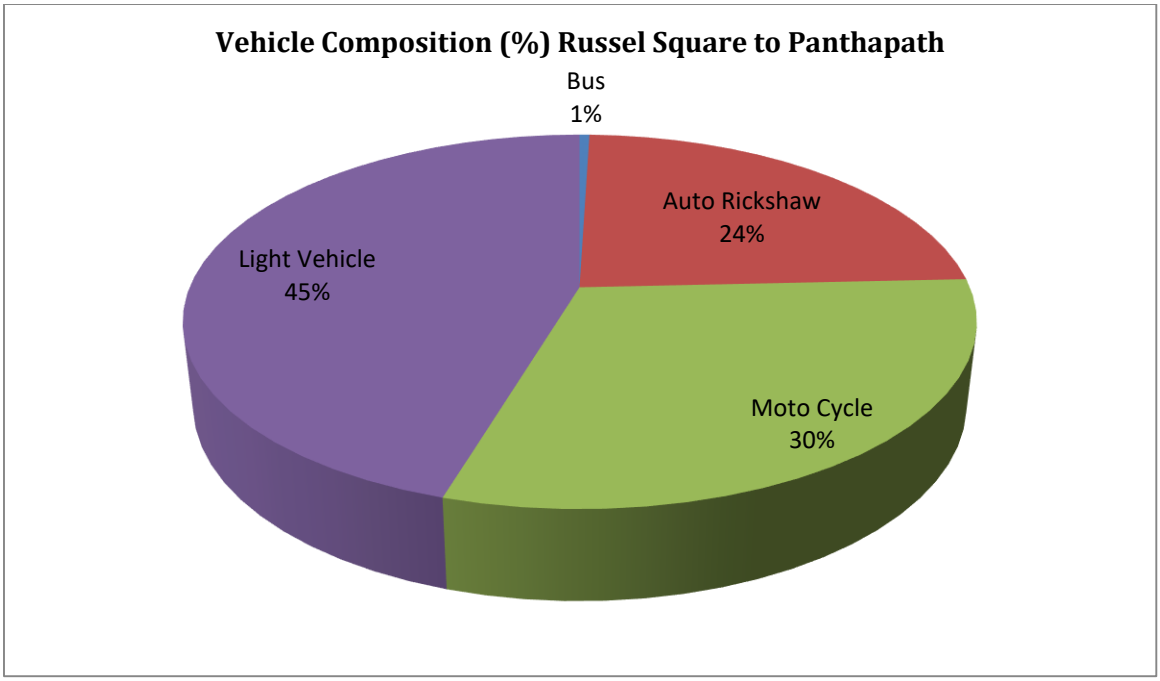


Figure 4-4: Pie Chart of Vehicle Composition (Group), Russell Square to Panthapath

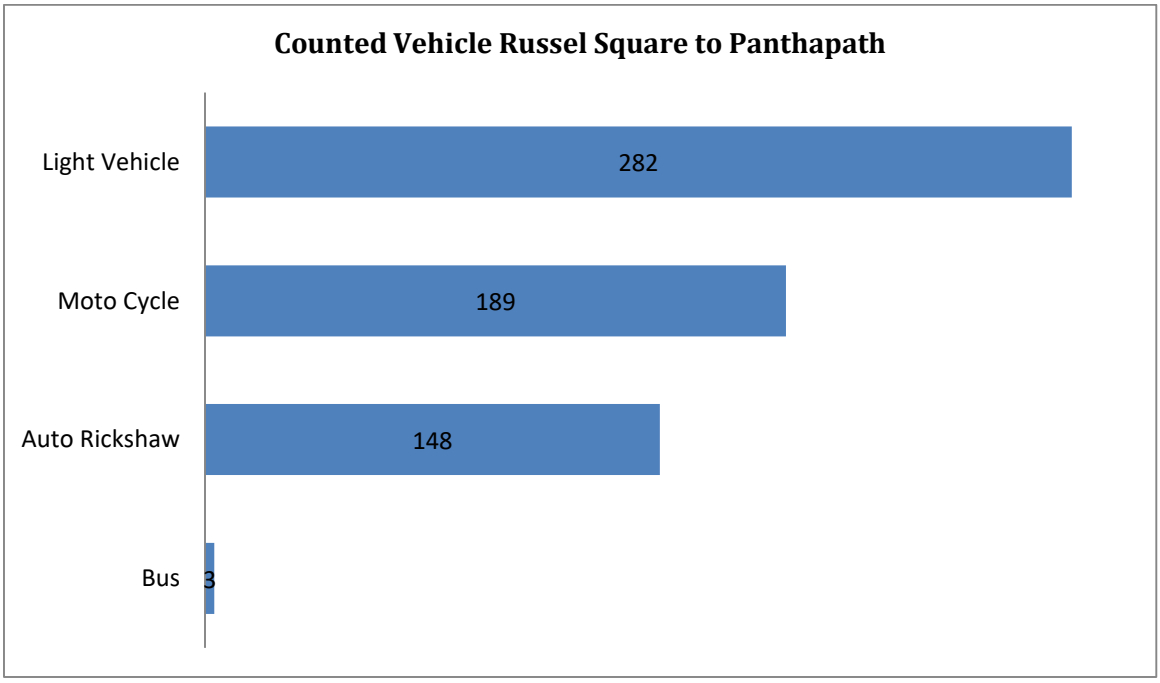


Figure 4-5: Bar diagram of counted vehicle (Russel Square to Panthapath

4.7.2 Service Flow Rate (PCU unit) of Group

As per geometric design standard RHD, version 4 (appendix), service flow rate from Panthapath to Russel Square (Group-) is presented in the following table:

Vehicle Type	Total Vehicle(30min)	PCU factor	Total PCU(30min)	PCU/hour
Bus	3	2	6	12
Light Vehicle	282	1	282	564
CNG car	148	0.75	111	222
Motor Cycle	189	0.75	141.75	283.5
Others	0	N/A	0	0
Total			540.75	1081.5

Table 4-5: Service Flow Rate (PCU unit) of Group

4.7.3 Service Flow Rate (PCU) of Groups

Service Flow Rate of Panthapath to (Panthapath to Russel Square & Russel Square to Panthapath):

Vehicle Type	PCU/hour	
	Panthapath to Russel Square	Russel Square to Panthapath
Bus	12	20
Light vehicle	564	960
cng	222	369
motorcycle	283.5	435
others	0	0
Total	1081.5	1784

Table 4-6: Service Flow Rate of (Panthapath to Russel Square & Russel Square to Panthapath)

4.7.4 Directional Distribution

The percentage ratio of the service flow of both directions (section 4.7.3) helps to find the directional distributions.

Time	Direction	Group	Service Flow Rate (PCU/hour)	Total	Directional Distribution (%)
9:00-9:30	E-W		1081.5	2865.5	37.79
3:00-3:30	W-E		1784		62.21

Table4-7: Directional Distribution (%)

4.7.5 Peak Hour Factor (PHF)

The peak hour factor (PHF) is the hourly volume during the maximum-volume hour of the day divided by the peak 15-minute flow rate within the peak hour.
Details calculation is shown below:
Group has the highest flow rate which is 1784 PCU/hr.

Vehicle Type	Interval(minutes)					
	0-5	**5-10**	**10-15**	**15-20**	**20-25**	**25-30**
Bus	1	0	1	1	1	1
Light Vehicle	83	79	82	88	72	76
Auto Rickshaw	40	42	37	45	38	44
Motor Cycle	44	49	43	45	47	53
Total PCU	**150**	**148.25**	**144**	**162.50**	**138.75**	**158**

Table 4-8: Peak Hour Factor (PHF)

$$PHF = \frac{1928.5}{4(150+162.5+158)} = 1.025$$

Observation:

1. PHF measures traffic demand fluctuations within the peak hour. It generally varies between 0.85 to 0.95. Our value agrees with it.

2. From short count data, the actual (design) flow rate can be calculated by dividing the peak hour volume by the PHF, or by multiplying the peak 15 minutes volume by four.

4.7.6 Estimate ADT and AADT

Details calculation of ADT and AADT are given below. Expansion factors used here are known as Mohib's JMB Factors. Details chart of this factor is given in appendix A. Data of flow rate used here are taken from sub-section 5.3.2

Here,

MEF = 1.355 for November (Appendix A: Table 1)

DEF = 7.012 for Thursday (Appendix A : Table 2)

HEF = 18.52 (Time: 3.00 PM- 3.30 AM) (Group) (Appendix A: Table 3)

Estimated 24 hour volume for Thursday (Russell square to Panthapath /W to E), using HEF = (1784 x 18.52)

= **33040 PCU**

From 24 hour volume for Thursday estimated volume for the week using DEF,

Total 7 days volume

= 333040 x 7.012

= 2335276.48 PCU

= **233752 PCU**

Average 24 hours volume (on average daily traffic, ADT)

= 233752/7

=33393 PCU (Russell Square to Panthapath) (Group)

Since the data were collected in November, using the MEF for November, obtained AADT is

AADT=33393 x 1.355

=**45248 PCU**

Now, From Panthapath to Russell Square,

HEF = 22.05 (Time: 8.00 AM- 8.30 AM) (Group) (Appendix A: Table 3)

Now,

Estimated 24 hour volume for Thursday (Panthapath to Russell Square), using HEF

= (1081.5x 22.05)

= 23847.075PCU

= **23847 PCU**

From 24 hour volume for Thursday estimated volume for the week using DEF Total 7 days volume

= 23847 x 7.012

= 167215.16 PCU

= 167215 PCU

Average 24 hours volume (on average daily traffic, ADT)

= 167215/7

=**23887 PCU** (Panthapath to Russell Square) (Group-6)

Since the data were collected in November, using the MEF for December

obtained AADT is AADT=20112 x 1.355

=32727 PCU

4.7.7 Flow fluctuation` Curve

For drawing the flow fluctuation curve, flow rate mentioned in section 5.3.2 and expansion factors mentioned in appendix A is used to calculate ADT and then % ADT.

Panthapath to Russell square							
Time	FlowRate (pcu/hr)	HEF	Estimated 24 hr volume(pcu)	DEF	Estimated volume forthe week(pcu/day)	ADT (pcu/day)	%ADT
9.00-9.30AM	1081.5	22.05	23847.075	7.012	167215.68	23887	41.97
Total ADT(Panthapath to Russel Square) =						23887	

Table 4-9: Flow fluctuation Curve

Russell Square to Panthapath							
Time	Flow Rate (pcu/hr)	HEF	Estimated24hr volume(pcu)	DEF	Estimated volume fort he week(pcu/day)	ADT (pcu/day)	%ADT
3.00-3.30PM	1784	18.52	33039.68	7.012	231674.2363	32727	58.03
Total ADT(Russel Square to Panthapath) =						32727	

Table 4-10:Data for the Determination of% ADT

%ADT is calculated based on the total ADT calculated at different times

Chapter 5

Conclusion and Recommendation

With each passing day, traffic congestion continues to worsen. The roads are increasingly clogged with vehicles, yet the situation shows little improvement. A survey was conducted on the Panthapath to Russell Square Road on Thursday, November 28. Although the data collected during this study was somewhat inaccurate due to the limitations of a manual survey, it still highlights some of the key reasons behind the frequent congestion on Dhaka's roadways.

5.1 Discussion on vehicle composition

Light motor vehicles (passenger cars) make up the largest portion of the pie chart, accounting for 45%, followed by motorcycles at 29.3%, and buses at just 1%. This location is in close proximity to several offices, hospitals, shopping centers, educational institutions, and residential areas, making motor vehicles the preferred mode of transport for most passengers. However, bus usage remains extremely low.

The dominance of passenger cars can be attributed to the upper-income demographic prevalent in the surrounding residential area. During the survey, we observed that the majority of cars were carrying only one or two occupants, contributing significantly to traffic congestion.

This finding highlights the need for policies to restrict the excessive use of passenger cars and encourage shared vehicle travel. Promoting the use of buses, which can accommodate up to fifty passengers and replace numerous individual vehicles, is crucial. To address this issue, proper measures should be implemented to improve public transportation and encourage its use.

5.2 Discussion on directional distribution

Light motor vehicles (passenger cars) account for the largest portion of the pie chart at 45%, followed by motorcycles at 29.3% and buses at just 1%. This area is located near several offices, hospitals, shopping centers, educational institutions, and residential neighborhoods, making motor vehicles the preferred mode of transportation for most passengers. However, bus usage remains notably low.

The dominance of passenger cars is largely due to the upper-income demographic prevalent in the surrounding residential area. During the survey, it was observed that most cars carried only one or two occupants, significantly contributing to traffic congestion.

This observation underscores the need for policies to limit the overuse of passenger cars and promote shared vehicle travel. Encouraging the use of buses, which can replace up to fifty passenger cars, is essential. Effective measures should be implemented to enhance public transportation and encourage its adoption, ultimately reducing congestion and improving traffic flow.

5.3 Discussion on flow fluctuation

For 30 minutes, each group counted automobiles. From the short count data, the flow rate was determined, then converted to a 1hr value and shown. At 9:00-9:30 a.m., the flow fluctuation curve displays one peak. The vehicle movement in the direction of Russell square to Panthapath changes less, as seen by the flow fluctuation curve. At 9:00-9:30 a.m., the percent of ADT for the Panthapath to Russell Square direction is higher.

5.4 Recommendation

• A proper law should be implemented to limit the use of passenger cars;

• More rewards should be provided to encourage more people to use public transportation;

• Random vehicle parking should be prohibited and heavily penalized;

• No NMV should be permitted.

• Cross bridges when pedestrian crossing is required.

• Illegal hawker stands should be shut down.

• Pedestrian mobility should be limited so that they do not take up too much space on the road.

• To avoid traffic congestion, hospitals, schools, buildings, and other market areas near that region should have dedicated parking facilities.

• The signal should be properly visualized.

5.5 Limitation

• Now a day's automatic counting method based on Video image processing is more reliable. But due to resource constraint it was not possible

• The major limitation of this volume study was the survey was conducted for 25 minutes only, whereas for proper results the survey should be conducted for at least 1 hours

• As it was a manual survey, the results are erroneous though every member of the group worked very hard and attentively

5.6 Recommendation for future work

For more reliable data automatic data collection process should be used. Different and new methods of volume study can be used instead of manual survey so that more precise understanding can be gained from the results. Funding should be increased. And safety measurement should be increased.

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APPENDIX

Appendix A

Table 1: Monthly Expansion Factors for a Rural Primary Road

Month of Year	MEF	Month of Year	MEF
January	1.756	July	0.578
February	1.976	August	0.521
March	1.635	September	0.632
April	1.482	October	0.948
May	1.395	November	1.186
June	0.948	December	1.35

Table 2: Daily Expansion Factors for a Rural Primary Road

Days of Week	DEF
Sunday	9.515
Monday	7.012
Tuesday	7.727
Wednesday	6.582
Thursday	7.012
Friday	5.724
Saturday	6.51

Table 3: Hourly Expansion Factors for a Rural Primary Road

Hour	HEF	Hour	HEF
6:00- 7:00 a.m.	42.01	6:00- 7:00 p.m.	16.6
7:00- 8:00 a.m.	28.99	7:00- 8:00 p.m.	17.5
8:00- 9:00 a.m.	22.05	8:00- 9:00 p.m.	20.4
9:00- 10:00 a.m.	18.8	9:00- 10:00 p.m.	25.3
10:00- 11:00 a.m.	17.11	10:00- 11:00 p.m.	31.2
11:00- 12:00 p.m.	18.52	11:00- 12:00 a.m.	34.2
12:00- 1:00 p.m.	18.71	12:00- 1:00 a.m.	51.2
1:00- 2:00 p.m.	16.71	1:00- 2:00 a.m.	82.3
2:00- 3:00 p.m.	14.84	2:00- 3:00 a.m.	124
3:00- 4:00 p.m.	14.77	3:00- 4:00 a.m.	137
4:00- 5:00 p.m.	12.85	4:00- 5:00 a.m.	144
5:00- 6:00 p.m.	13.85	5:00- 6:00 a.m.	90.2

Appendix B

Table 1: Data of our Group

Vehicle Composition								Service Flow Rate		
Vehicle Type	Interval						Total	PCU Factor	Total PCU	PCU/h our
	0 to 5	6 to 10	11 to 15	16 to 20	21 to 25	26 to 30				
Bus	5	3	0	2	0	0	10	2	20	40
Light Vehicle	55	25	33	58	20	49	240	1	240	480
CNG Rickshaw	10	30	35	25	55	15	170	0.75	127.5	255
Motor Cycle	23	61	22	45	48	56	255	0.75	191.25	382.5
Total									578.75	1157.5

Table 2: Data of our Group

Vehicle Composition								Service Flow Rate		
Vehicle Type	Interval						Total	PCU Factor	Total PCU	PCU/hour
	0 to 5	6 to 10	11 to 15	16 to 20	21 to 25	26 to 30				
Bus	2	2	1	0	0	0	5	2	10	20
Light Vehicle	88	90	40	76	49	39	414	1	414	828
CNG Rickshaw	25	25	30	20	20	30	150	0.75	112.5	225
Motor Cycle	55	61	58	60	60	56	350	0.75	262.5	525
Total									799	1598