Analysis of Traffic Congestion At Ettumanoor Kottayam Route and Its Solution

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***Abstract*— The spontaneous increase in number of vehicles on road attributes the ingeneration of traffic problems like accidents, traffic congestion and delay. Traffic congestion is a condition in transportation characterized by slower speeds, long travel time and increased vehicular queueing. Nowadays it is the most complex issue of transportation due to increase in high ownership of vehicles. A substantial portion of working hours is getting wasted on the road. Poor public transportation system, rapid increase in population, unplanned transport infrastructure are the primary causes of congestion. The purpose of our study is to analyze the present condition of the area and to find out solutions for the problems using factor analysis. Etumanoor town is one of the most congested places along MC road in Kottayam district that's why we choose Ettumanoor Kottayam route for our study. There are many factors that lead to traffic congestions at different spots and by analyzing these factors we find out the solutions.**

Keywords: Traffic congestion, traffic demand, transportation system.

I. INTRODUCTION

Traffic congestion is a transport condition that occurs due to slower speeds, improper signals, less awareness about traffic rules and regulations, decrease in road capacity. Population rate of India is increasing day to day and the demand of private vehicle is also increasing. An efficient network of transport service is required to support the complex activity patterns within city, there is a strong relation between transportation and city development in our area.

The main purpose of transportation is to provide an efficient means to satisfy human needs for a heterogeneous variety of societal groups. Therefore, the general goal is to meet this need for mobility. urban transportation planning contains several activities like analyzing present condition of the area such as the land use patterns and travel demand produced from the land development. After that development plans are prepared by forecasting the land, travel demand, population etc. the purpose of the process is to perform a prediction of travel demand and after that suitable alternative are implemented to reduce the traffic congestion.

In this study we analyze the traffic flow at Ettumanoor Kottayam route by conducting transportation surveys and traffic volume, speed is calculated. we selected 5 major spots for our study which contains intersections. After the pilot survey we find out many factors which lead to congestion and among those 9 factors are taken for detailed survey. Traffic volume at 5 spots is taken during morning and evening peak hours. Traffic speed is taken manually. Questionnaire survey is conducted based on 9 factors. SPSS software is used to analysisthese factors.

II. LITERATURE REVIEW

The studies bring about the salient points of published literatures and other works.

1. Tanzina Afrin and Nila Yodo(7 JUNE 2020) " A survey of road traffic congestion measures towards sustainable and resilient transportation system." It identified the root causes of congestion. The advantages and disadvantages of each measure are identified from data analysis.

2. A.Vinidha Roc, P.R , Banuprakash, G.Paul Asir Ninon Raj,L. Prasad.(July 2017) " SMART TRAFFIC LIGHT SYSTEM",A system of cameras are used to regulate their obtained information in their respective places and coordinates with other camera in the system to change traffic signals and suggest green signal for that route to avoid maximum traffic. Image processing unit is the central unit to maintain the traffic in normal; speech processing unit is secondary unit, the combined processing is important only in emergence.
3. Geethu Lal, Divya L.G., Nithin K.J,Susan Mathew , Bennet Kuriakose (2016) " sustainable traffic improvement for urban road intersections of developing countries; A Case study of Ettumanoor , INDIA.", The

analysis of the collected data from the direct field survey of traffic volume , land use, and pedestrian counts reveals that improper planning, unauthorised parking, lack of signal are the main causes. Junction signalization and junction improvement are the remedial measures proposed.

4. C.H.Mohammed Koya KMGA Engineering College, Kerala. Volume 6, special issue 4 (march 2017). " traffic and are improvement of baker junction", 2 intersection in Kottayam town is considered as the project stretch and relevant data's are collected. By analysing all the problems suitable improvement proposals are adopted.

5. Shijilk, Geeva George , Dr Praveena, International Journal of Engineering, "Construction Phase Road Safety Audit Of Kottayam Ettumanoor MC road", the challenges to road safety of spots are identified. Spot speed study was conducted. Factors were identified based on negative response survey and switching response survey.

III. OBJECTIVES OF WORK

- To access the existing condition of road network andto identify the major gridlocks.
- To identify various factors governing the trafficcongestion.
- To collect the traffic volume and speed.
- To identify people's opinion and suggestions.
- To establish proper solutions for the specificproblems.

IV. METHODOLOGY

Identify the major junctions at Etumanoor Kottayam route

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5 major spots are taken

↓

Conduct pilot survey and identify factors that cause congestion.

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Data collection by survey

- Traffic volume
- Traffic speed
- Questionnaire survey

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Data analysis

- SPSS software

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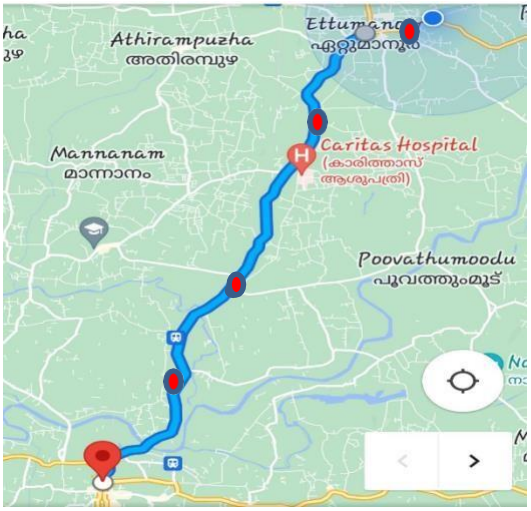
Result

V. STUDY AREA

First, we visited the study area and reduce long route into 5 major spots which contains deviation.

Major spots are;

- Ettumanoor bus stand
- Adichira
- Chavittuvari
- Gandhinagar
- Nagambadam



ROUTE MAP FROM ETUMANOOR TO KOTTAYAM

V. DATA COLLECTION

The different data required for study is collected through trafficsurveys.

1. TRAFFIC VOLUME

It is defined as the procedure to determine volume of traffic moving on the roads at a particular time. It is done by counting the vehicles during morning peak hours [8 to 10am] and evening peak hours [3.30 to 5.30 pm]. The volume count at selected 5 spots was carried out and existing condition of the road stretches are analysed. The result obtained are shown below;

- *TRAFFIC VOLUME AT ETUMANOOR BUS JUNCTION*
- *MORNING PEAK HOURS*

Table 1 numb of vehicles towards Adichira from Ettumanoor

VEHICLE	TIME			
	8:00 to 8:30	8:30 to 9:00	9:00 to 9:30	9:30 To 10:00
CAR	290	324	519	483
BIKE	298	398	610	511
LORRY AND TRUCK	35	30	35	38
BUS	32	48	46	48
THREE-WHEELER	45	62	127	108

EVENING PEAK HOURS

Table 2 numb of vehicles during evening peak hours

VEHICLE	TIME			
	3:30 to 4:00	4:00 to 4:30	4:30 to 5:00	5:00 to 5:30
CAR	455	495	520	539
BIKE	460	503	548	560
BUS	60	75	80	86
LORRY AND TRUCK	38	30	29	24
THREE-WHEELER	150	165	178	189

MORNING

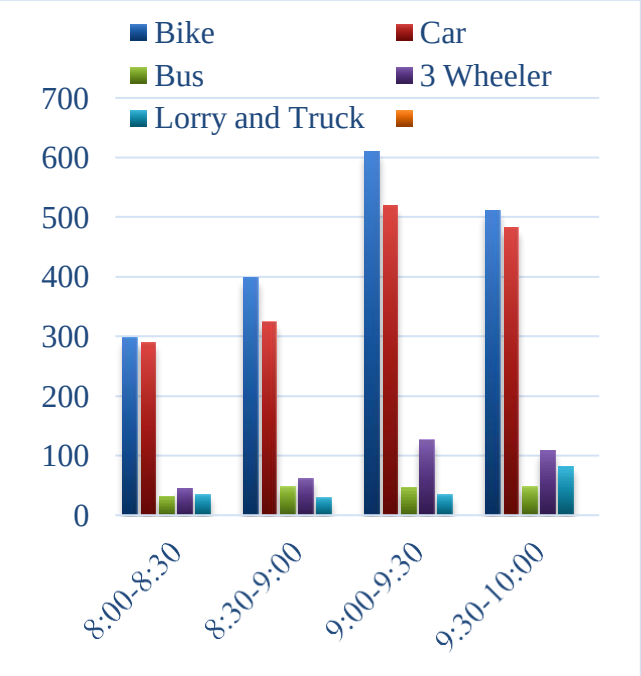


Fig.1. Number of vehicles versus time on 21/03/2022

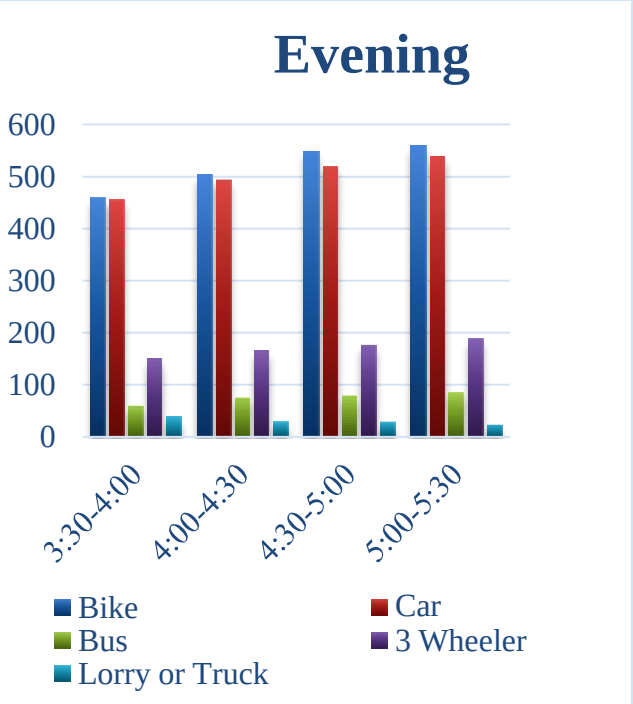


Fig .2.Number of vehicles versus time on 21/03/2022

Vehicle count on remaining 4 spots were taken in similarmanner and was considered for result analysis.

II. TRAFFIC SPEED

Traffic speed count was collected from 5 spots.Formula:
SPEED = DISTANCE / TIME
Ettumanoor to Adichira, Distance = 5.9 km

Table .3. Speed count of car

TIME	VEHICLE TYPE	VEHICLE NUMBER	CONSUMPTION OF TIME	SPEED [M/ SEC]
8:00-10:00 AM	CAR	05	10 min	9.8
	CAR	25	12 min	8.2
	CAR	36	10 min	9.8
	CAR	45	14 min	7.0
	CAR	66	9 min	10.9
	CAR	28	12 min	8.2
	CAR	55	9 min	10.9
	CAR	58	14 min	7.0
	CAR	15	9 min	10.9
	CAR	18	12 min	8.2
3:00-5:00 pm	CAR	08	13 min	7.5
	CAR	67	10 min	9.8
	CAR	52	10 min	9.8
	CAR	75	13 min	7.5
	CAR	29	9 min	10.9
	CAR	38	15 min	6.5
	CAR	24	10 min	9.8
	CAR	30	9 min	10.9
	CAR	86	9 min	10.9
	CAR	59	11 min	8.9

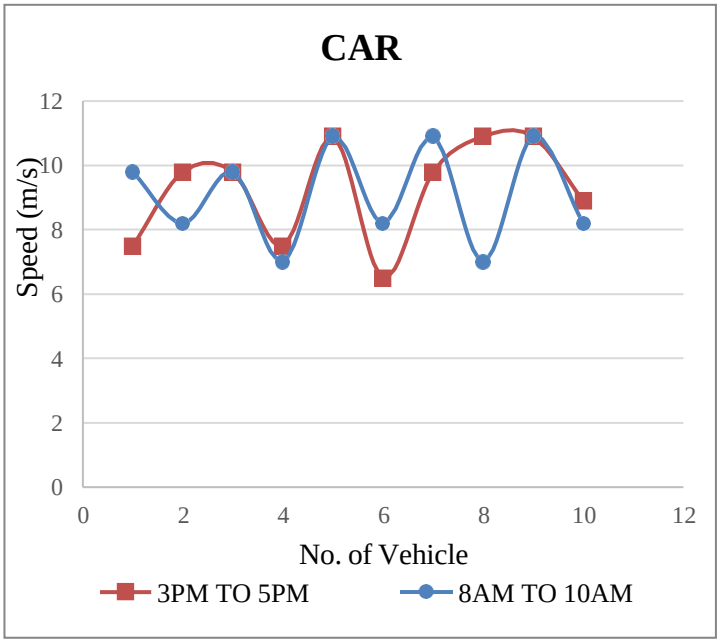
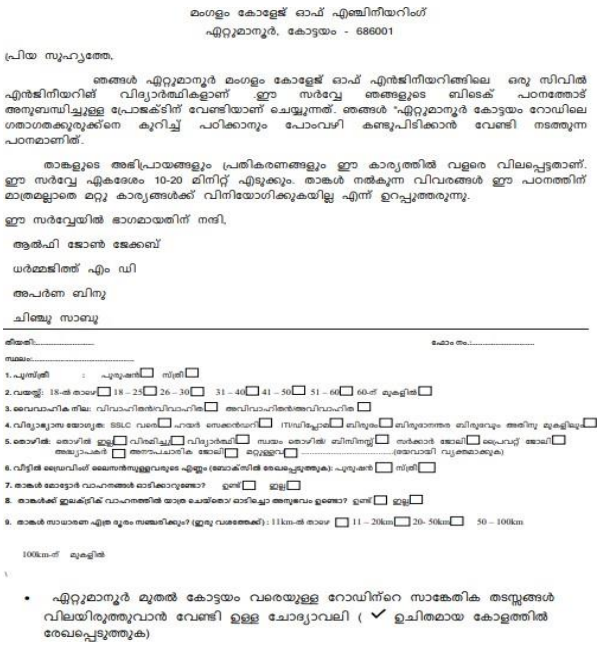


Fig .3. numb of vehicle versus speed

The vehicle speed data of bus, bike, lorry and truck and three-wheeler was estimated and analysed similarly.

III. QUESTIONNAIRE SURVEY

To identify people's opinion regarding gridlock on the road, we conducted a well tabled questionnaire survey on a pool of 190. Each question booklet contained 12 questions fragmented to 9 factors and all the participants were enthusiastic about thesurvey.


മംഗളം കോളേജ് ഓഫ് എഞ്ചിനീയറിംഗ്
ഏറ്റുമാനൂർ, കോട്ടയം - 686001

പ്രിയ സുഹൃത്തേ,

ഞങ്ങൾ ഏറ്റുമാനൂർ മംഗളം കോളേജ് ഓഫ് എൻജിനീയറിങ്ങിലെ ഒരു സിവിൽ എൻജിനീയറിങ് വിദ്യാർത്ഥികളാണ് .ഈ സർവ്വേ ഞങ്ങളുടെ ബിടെക് പഠനത്തോട് അനുബന്ധിച്ചുള്ള പ്രോജക്ടിന് വേണ്ടിയാണ് ചെയ്യുന്നത്. ഞങ്ങൾ "ഏറ്റുമാനൂർ കോട്ടയം റോഡിലെ ഗതാഗതക്കുരുക്കിനെ കുറിച്ച് പഠിക്കാനും പോംവഴി കണ്ടുപിടിക്കാൻ വേണ്ടി നടത്തുന്ന പഠനമാണിത്.

താങ്കളുടെ അഭിപ്രായങ്ങളും പ്രതികരണങ്ങളും ഈ കാര്യത്തിൽ വളരെ വിലപ്പെട്ടതാണ്. ഈ സർവ്വേ ഏകദേശം 10-20 മിനിറ്റ് എടുക്കും. താങ്കൾ നൽകുന്ന വിവരങ്ങൾ ഈ പഠനത്തിന് മാത്രമല്ലാതെ മറ്റു കാര്യങ്ങൾക്ക് വിനിയോഗിക്കുകയില്ല എന്ന് ഉറപ്പുത്തരുന്നു.

ഈ സർവ്വേയിൽ ഭാഗമായതിന് നന്ദി,

ആൽഫി ജോൺ ജേക്കബ്

ധർമ്മജിത്ത് എം ഡി

അപർണ ബിനു

ചിഞ്ചു സാബു

- ഏറ്റുമാനൂർ മുതൽ കോട്ടയം വരെയുള്ള റോഡിന്റെ സാങ്കേതിക തടസ്സങ്ങൾ വിലയിരുത്തുവാൻ വേണ്ടി ഉള്ള ചോദ്യാവലി (✓ ഉചിതമായ കോളത്തിൽ രേഖപ്പെടുത്തുക)

	ചോദ്യം	പ്രസ്തുത പ്രസ്താവനയിൽ താങ്കൾക്കുള്ള അഭിപ്രായം രേഖപ്പെടുത്തണമെന്ന് സൂചിക				
1	റോഡിന്റെ വീതി മൂലം താങ്കൾക്ക് തടസ്സങ്ങൾ നേരുന്നു	ശക്തമായ യോജിക്കുന്നു	യോജിക്കുന്നു	അഭിപ്രായമില്ല	വിയോജിക്കുന്നു	ശക്തമായി വിയോജിക്കുന്നു
2	നിലവിലുള്ള റോഡിന്റെ വീതിയിൽ നിങ്ങൾ സംതൃപ്തരാണ്					
3	എല്ലാ കാലാവസ്ഥയിലും ഈ റോഡിലൂടെയുള്ള യാത്ര സുഖമാണ്					
4	സിഗ്നൽ സംവിധാനം നിലവിൽ വന്നാൽ അപകടങ്ങൾ ഉള്ള എണ്ണം കുറയ്ക്കാൻ സാധിക്കുമ					
5	റോഡരികിലുള്ള അനധികൃതമായ പാർക്കിംഗ് മൂലം തടസ്സങ്ങൾ നേരിടുന്നു					

Fig .4. Questionnaire survey format

The opinions from questionnaire survey is converted to Likert scale with 5 points. And kept for software analysis. We use Statistical Package for Social Science [SPSS] software and done factor analysis.

VI. DATA ANALYSIS

I. SOFTWARE ANALYSIS

With the help of SPSS software, we done factor analysis and reduce 9 components to 3 variables. First of all, we have 9 factors for our analysis. The purpose of factor analysis is to reduce our number of variables into a smaller number of components. The number of variables we input in our analysis, will always be equal to the number of components. Eigenvalues are shown in fig. the number of factors or components that have eigenvalues greater than one are taken. All other components with eigenvalues less than one, we do not keep. Since only 3 components had an eigenvalue greater than one, we only have 3 components in our solution. We reduce those 9 factors to 3 components. Some of eigenvalues will be always equal to the number of components.

FFFFF

Factor Analysis

[DataSet0]

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
VAR00001	4.3526	.61452	190
VAR00002	4.1737	.85841	190
VAR00003	3.2211	.92214	190
VAR00004	4.2789	.68319	190
VAR00005	3.1000	1.02637	190
VAR00006	4.0000	.77664	190
VAR00007	4.2421	.81929	190
VAR00008	4.1947	.78273	190
VAR00009	4.1053	.92552	190

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.606
Bartlett's Test of Sphericity	Approx. Chi-Square	94.235
	df	36
	Sig.	.000

Table.4. Factor analysis

Table shows KMO and Bartlett's test values. the std value for KMO and Bartlett's test should be more than 0.5 and less than 0.05.it actually testing whether correlation matrix are related.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.860	20.663	20.663	1.860	20.663	20.663	1.465	16.275	16.275
2	1.323	14.700	35.363	1.323	14.700	35.363	1.389	15.434	31.708
3	1.014	11.270	46.633	1.014	11.270	46.633	1.343	14.925	46.633
4	.959	10.658	57.291						
5	.908	10.089	67.380						
6	.832	9.240	76.620						
7	.795	8.836	85.456						
8	.755	8.390	93.846						
9	.554	6.154	100.000						

Extraction Method: Principal Component Analysis.

The test result shows that variable 6 contribute maximum amount of congestion in road. Roadside shops are variable 6 and it creates major traffic congestions. It reduces road width and parking spaces on road.

VII. CONCLUSION

Traffic congestions are mainly created by traffic users by misbehaving in road and violating the rules. Congestion on Ettumanoor Kottayam route can be solved by providing proper width for road, avoid congested road side shops, provide parking area for vehicles, separate lane for heavy vehicles, proper signals, bypass roads etc. Parking should be restricted on the roads as it decreases the width of carriageway. By factor analysis we found that each factors contribute how much amount of congestion on road. Public transport should be increased to reduce gridlocks and accidents.

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