ISSN (Online): 2456-5717

International Journal of Advanced Research in Basic Engineering Sciences and Technology (IJARBEST)
Vol.3, Issue.4, April 2017

Traffic Impact Study on Central Business District Tirunelveli City

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Abstract– **Traffic impact study gives the outcome of vehicular traffic on a city. Tirunelveli city has more number of schools, colleges, educational institutions and commercial buildings, etc. Because of the above features and increase in population growth makes large number of trips into the city which brings the traffic congestion and accident. The traffic congestion and accident will cause a severe impact on ultimate goal of people's mobility. Due to traffic congestion time taken to reach the destination of a road user is higher than the normal time. Accidents are a drain on the national economy and may lead to disablement, death, damage to health and property, social suffering and general degradation of environment. In Tirunelveli city, the route from Tirunelveli new bus stand to Tirunelveli town is the highest traffic congestion way. So, a study planned to identify the existing condition of traffic on this route by conducting traffic surveys such as traffic volume count, travel time and delay analysis, parking survey, pedestrian count. Black spots were also found out within the city by collecting and analysing accident data. An alternative solution was given. Thereby reducing the traffic impact on the city.**

Index terms: **Traffic congestion, Traffic Volume count, Black spot.**

I. INTRODUCTION

Traffic on road system consist of pedestrians, ridden animals, vehicles, streetcars, buses and other conveyances, either singly or together, while using the public way for purposes of travel. Vehicular traffic is an extremely complex dynamic process associated with the spatiotemporal behaviour of many particle systems. Growing number of vehicular trips by cars and two wheelers which result in traffic congestion, air pollution and traffic accidents has become a major concern in urban areas.

A Traffic Impact Study (TIS) is an important tool in the overall development planning process. It provides information which will allow local governments to evaluate the impact of the development with respect to the need for roadway/intersection capacity and operation and safety improvements. The TIS shall also identify mitigation measures for the impacts identified. Traffic congestion occurs wherever demand exceeds the capacity of the transportation system. City governments attempted to solve transport crises as isolated road improvement projects. Analysis of existing conditions, Trip Generation and Distribution, Analysis of future conditions are the basic steps involved in TIS.

Traffic congestion has a number of negative effects: Wasting time of motorists and passengers, congestion reduces regional economic health, Delays, Inability to forecast travel time accurately, and less time on productive activities, air pollution, Wear and tear on vehicles as a result of idling in traffic and frequent acceleration and braking, Higher chance of collisions due to tight spacing and constant stopping-and-going. Etc.,

So in this study we are going to collect the accident data and identification of black spot, find out the volume count, trip generation, pedestrian survey, parking survey in the study area.

1.1.Objective of the Study

- To determine the existing traffic condition in the study area.
- To study the reason for the traffic congestion and accident prevailing in that area.
- To minimize the traffic congestion and accident by suggesting suitable solutions.

II. STUDY AREA

Tirunelveli also known as Nellai is a city in the South Indian state of Tamil Nadu. It is the administrative headquarters of the Tirunelveli district. It is the sixth-largest municipal corporation in the state. The city is located on the west bank of the Thamirabarani River; its twin city Palayamkottai is on the east bank. The city is an educational hub of southern Tamil Nadu, with institutions such as Tirunelveli Medical College, the Veterinary College and Research Institution, Tirunelveli Law College and the Government College of Engineering. Tirunelveli is administered by a municipal corporation, established in 1994 by the Municipal Corporation Act. The city covers an area of 169.9 km2, and had a population of 473,637 in 2011. Tirunelveli is well-connected by road and rail with the rest of Tamil Nadu. The study area has the important tourist traffic like Nellaiyappar Temple and other shopping Malls like "Pothys", "RMKV", "The Chennai Silks", "Reliance Market" and educational institutions, hospitals, Railway junction, etc. It attracts more no of trips and daily shoppers in and around Tirunelveli district creating traffic congestion, accident, and unwanted delay. Hence there is a need for the study to analyse the present situation and to suggest the remedial measures to avoid traffic congestion and unwanted delay in traffic.

III. DATA COLLECTION

3.1.Accident Data of Tirunelveli City:

The following table is showing the accident data of Tirunelveli city. The data collected reflects the view of the reporting Police Officer. According to the literature review accidental data collected from the Police Station is not the complete information because all accidents are not recorded in their FIR (First information report). Therefore, all accidental data may be increased by 25-30%.

Year	Fatal	Nonfatal	Total
2007	74	361	435
2008	87	361	448
2009	76	327	403
2010	89	326	415
2011	104	286	390
2012	87	285	372
2013	88	308	396
2014	94	299	393
2015	87	267	354
2016	78	117	295

Table No 3.1: Accident Data Of Tirunelveli City

3.2. Black Spot Identification:

From the accident data of Tirunelveli city eleven black spot are identified. The following are that spot.

1. Tirunelveli junction: Tiruvalluvar two tier over bridge.
2. Tenkasi road near Pettai, Gandhi Nagar.
3. Thatchanallur bypass road junction.
4. Palayamkottai, Tiruchendur road in front of court.
5. Tiruchendur road, near Iyyanar Timber Depot, Samathanapuram.
6. Vannarpettai North bypass road, near Aircel tower.
7. Vannarpettai north bypass road, near K.P.N. travels.
8. Vannarpettai north bypass road, near Ulagamman Kovil.
9. Vannarpettai south bypass road, near Karan T.V, Annachi hotel.
10. Vannarpettai bypass road, Ambai road junction, near reliance petrol bunk.
11. Four way track from Palayamkottai Pottal Vilakku to IRT polytechnic and Ayankulam city limit.

3.3.Traffic Congested Area within the City

1. Palayamkottai Market.
2. Near Palayamkottai bus stand.

3. Vannarpettai.
4. Sripuram near bridge.
5. Tirunelveli railway junction road.
6. Thachanallur junction.
7. Melapalayam junction.

The following Table 3.2 shows the PCU values of the study area during peak hours at various locations.

Location	Traffic volume in PCU	
	Morning peak hour	Evening peak hour
Melapalayam near Reliance petrol bunk	1701	1802
Vannar pettai	4667	5075
Palayamkottai near bus stand	4167	4218
Near Sripuram bridge	1690	1725
Thachanallur junction	2812	2605

Table 3.2 PCU value of the study area

3.4. Pedestrian survey

The pedestrian survey was conducted on 9thJanuary 2017 at Vannar pettai where the area is having high PCU values. The following fig 3.1 shows the suggestion given by the pedestrians for the safe movement of people.

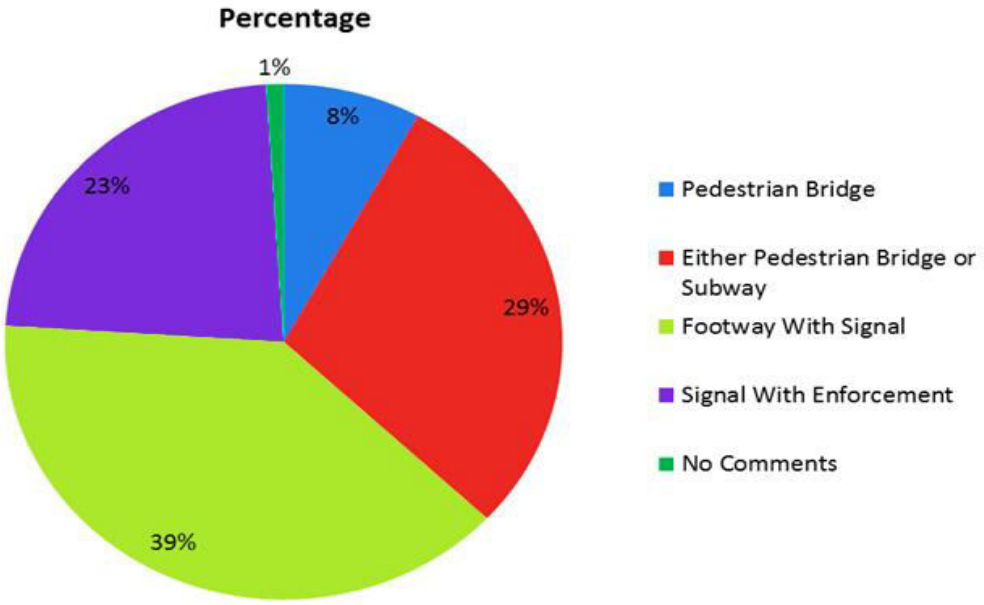

Fig 3.1 Suggestions given by the pedestrian

From the above figure the following points have been observed.

- 8% of the pedestrian suggest the requirement of foot over bridge.
- 29% of the pedestrian suggest the requirement of either foot over bridge or subways.
- 39% of the pedestrian suggest the requirement of footway with signal.
- 23% of the pedestrian suggest the requirement of signal with enforcement.
- 1% did not give any comments.

3.5. Travel time and Delay analysis

NAME OF STRETCH		DISTANCE	TIME (Min)	DELAY		TOTAL DELAY	JOURNEY TIME (Min)	RUNNING TIME, (Min)
FROM	TO			START	END			
New bus stand	Railway gate	1	1:40	1:20	1:40	0:20	1:40	1:20
Railway gate	Palayam kottai bus stand	0.5	1:40-4:20	3:10	4:20	1:10	2:40	1:30
Palayam kottai bus stand	Vaikkal palam	1	4:20-5:59	5:57	5:59	0:02	1:39	1:37
Vaikkal palam	Sidha hospital	0.3	5:59-6:21	6:05	6:21	0:16	0:22	0.06
Sidha hospital	Murugan kuruchi	0.6	6:21-7:30	7:02	7:30	0:28	1:09	0:41
Murugan kuruchi	Tower	0.5	7:30-8:16	7:40	8:16	0:36	0:46	0:30
Tower	Vannar pettai	1	8:16-12:31	11:52	12:31	0:39	4:15	3:36
Vannar pettai	Collector office	0.9	12:31-15:27	14:29	15:27	0:58	2:56	1:58
Collector office	Devar statue	0.8	15:27-18:01	17:26	18:01	0:35	2:34	1:59
Devar statue	Junction	0.5	18:01-19:09	18:40	19:09	0:29	1:08	0:39
Junction	Sripuram	0.5	19:09-21:51	20:01	20:58	0:57	2:42	1:45
Sripuram	Exhibition ground	0.5	21:51-23:09	22:59	23:09	0:10	1:18	1:08
Exhibition ground	Arch	0.4	23:09-25:00	24:32	25:00	0:28	1:51	1:23
Arch	Nellai Appar Temple	0.5	25:00-26:48	26:21	26:48	0:27	1:48	1:27

Table 3.3 Travel time and Delay analysis

3.6. Parking survey

The following table 3.4 shows the parking volume at Tirunelveli new bus stand and Tirunelveli railway junction.

Parking location	Average number of vehicle parking per day		
	bicycle	Two wheeler	Four wheeler
Near Tirunelveli new bus stand	100	3000	100
Near Tirunelveli railway junction	20	500	---

Table 3.4 Parking volume per day

IV. DATA ANALYSIS

4.1. Accident data

From the accident data collected the following table 4.1 shows the results of the causes of accidents at black spot within the study area.

S.No	Black spots	Reasons
1	Tirunelveli Junction, Tiruvalluvar two tier over Bridge.	Vehicles are Overtaking on the over bridge. This is the main reason for accident on the spot.
2	Tenkasi Road Near Pettai Gandhi Nager	This place is located on the outer area of the city. So, the vehicles are go fast, and over speed is the problem.
3	Thatchanallur bye pass road Junction	Error in Judgment during vehicle operation
4	Palayamkottai, Tiruchendur road In-front of Court.	This place is located in the city border, so that the vehicles are running speedy, over speed is the major problem**.**
5	Tiruchendur road Near Iyyanar Timber Depot, Samathanapuram	The road is very narrow; Vehicles are overtaking in this spot also.
6	Vannarpettai North bye pass road near Aircel Tower	Light Curve is present in the Road.
7	Vannarpettai North Bye pass Road Near K.P.N. Travels	Over Taking of vehicle
8	Vannarpettai North Bye pass Road Near Ulagamman Kovil	Residential Area

9	Vannarpettai South bye pass road near Karan T.V. , Annachi Hotel	The Road is Dark in condition due to poor lighting facility, No facilities provided for pedestrian.
10	Vannarpettai bye pass road, Ambai road Junction Near Reliance petrol bunk	Error in Judgment during vehicle operation
11	4 Ways Track From Palayamkottai Pottal Vilakku to IRT Polytechnic and Ayankulam City limit,	High Speed and Careless while driving**.** Sight distance problems along the longitudinal direction

Table 4.1.Reason for Accident

4.2. Travel time and Delay analysis

Origin = Tirunelveli new bus stand.
Destination = Nellai Appar temple (Tirunelveli town).
Length of the course = 9km
Total delay = 7.58 min
Running speed = length of the course /running time

= length of the course / (journey time - delay)

= 9/ ((27-7.58) x 60)

= 27.8

Running speed = 28kmph

Journey speed = distance /total journey time

= 9/ (27/60)

Journey speed = 20kmph.

V. RESULTS AND DISCUSSION

5.1. Suggestions to avoid accidents on black spots

S.No	Black spots	Suggestion
1	Tirunelveli Junction Tiruvalluvar two tier over Bridge	Road mark with yellow paint is needed. "No overtake on bridge" Sign board should fix.
2	Tenkasi Road, Near Pettai Gandhi Nager	Vehicle check post may be increased to minimize the vehicle speed. Speed breaker should be provided.
3	Thatchanallur bye pass road Junction	Signal may be provided or traffic police should be posted.
4	Palayamkottai , Tiruchendur road In-front of Court	Vehicle check points may be increased to minimize the vehicle speed. Speed breaker needed.
5	Tiruchendur road Near Iyyanar Timber Depot, Samathanapuram	Road Divider may be Fixed from Samathanapuram to Srinivasa Nager over Bride.
6	Vannarpettai North bye pass road near Aircel Tower	Sign board may be fixed to indicates the Road Curve
7	Vannarpettai North Bye pass Road Near K.P.N. Travels	Road Divider may be provided.
8	Vannarpettai North Bye pass Road Near Ulagamman Kovil	Sufficient street lights may be provided. Pedestrian Crossing may be provided
9	Vannarpettai South bye pass road near Karan T.V. , Annachi Hotel	Sufficient street lights have to be inserted. Pedestrian Crossing facilities also needed.
10	Vannarpettai bye pass road, Ambai road Junction Near Reliance petrol bunk	Now Signal lights needed and traffic police also need.
11	4 Ways Track From Palayamkottai Pottal Vilakku to IRT Polytechnic and Ayankulam City limit,	"GO slowly" sign board should be placed

Table 5.1 Solution to reduce the accident

5.2. Suggestions to avoid the traffic congestion and reduce the delay

1. Road over bridge at the railway gate.
2. Change the location of the Palayamkottai bus stand or change the entrance of bus stand.
3. Widening of bridge at Murugankuruchi or construction of new bridge parallel to the existing bridge.
4. At Vannarpettai pedestrian crossing facilities or subway for vehicle have to be provided.
5. Widening of bridge nearby collector office. or construction of new bridge over Thamirabarani river parallel to old bridge needed.
6. Widening of road throughout the length of the stretch or laying of new road form origin to destination.
7. At Thachanallur junction provision of signal along with Traffic police for to avoid traffic jam

5.3 Suggestions to improve parking facilities

1. The requirement of the parking area in the present situation is in sufficient condition but while considering the future due to lack of road width parking stream requires special attention.
2. At Palayamkottai market unnecessary parking and encroachment should be cleared for free flow of traffic and parking should be systemized near 'Jawahar Thidal'

VI. CONCLUSION

The rise in the growth of population in the urban areas due to migration from rural regarding various aspects increases the demand in use of transportation. It leads to more traffic congestion and causes problems to safe movement of vehicles and pedestrians in the CBD area. In order to reduce the traffic problem it is necessary to conduct various traffic surveys at the study area. In this project, Tirunelveli city CBD area was chosen as a study area and the traffic surveys such as traffic volume count, O-D survey, pedestrian survey, travel time and delay analysis, parking study were conducted and the suitable measures are suggested.

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