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Viability of Sub-urban Rail Transport System for a selected stretch

Meghana Bhalaki[1], Mythri T H[2], Rajeev R Prasad[3]
J. S. Vishwas[4], Ramesh B.V.[5]

1(U G Student Department of Civil Engineering, PES University, India)
2(U G Student Department of Civil Engineering, PES University, India)
3(U G Student Department of Civil Engineering, PES University, India)
4(Assistant Professor, Department of Civil Engineering, PES University, India)
5(Associate Professor, Department of Civil Engineering, PES University, India)

ABSTRACT

The cities of many developing countries are undertaking the implementation of rail transit systems, to fight traffic congestion and increase in the travel demand, also keeping in mind the goal of sustainable development. The paper involves the calculation of Journey time determined by travelling via train from Yeshwantpur Railway Station to Anekal Road Railway Station. Traffic flow, Running Speed, Running Time and Level of Service of the road were determined by Moving Car Observer Method. Classification and count of various vehicles was determined using Traffic Volume Count Method. The Origin and Destination survey conducted helped obtain a detailed picture of travel patterns and choices of travel of the employees working at various tech parks situated along our route.

Keywords: *Origin and Destination Survey; Level of Service; Moving Car observer Method; Suburban Rail Transport; Traffic Volume Count*

1. INTRODUCTION

From a pensioners' paradise to the hub of India's Information Technology revolution, Bengaluru has witnessed rapid growth in the last three decades and has come perilously close to keeling over. Unplanned and unchecked urban development has resulted in congestion and pollution in the city. An increase in the per capita income, purchasing power has led to an increase in the count of private vehicles in the city. This has a led to long traffic jams, choked junctions and increase in pollution levels. Namma Metro which was supposed to be a productive alternative mode of transport hasn't done much to help solve the problem. Bengaluru must rely on its old mass transportation system, i.e. the **Sub-urban Rail Transport** System to help find a more reliable long-term solution.

Bengaluru has a well laid out railway track running along its periphery. Arguably, built in 1922, it has been negligently used ever since. The track referred to here is the 67 km line, which passes through the IT capital's technology hubs such as Bellandur, Sarjapur and Electronic City. Recently, the Union Government has introduced new trains on this track. However, due to the lack of knowledge and the ignorance of the people, it is not being used to its full capacity.

Through our paper, we intend to stress upon the positives of commuting via **Sub-urban Railways** when compared to commuting by road. Analysis of data ascertained that use of the **Sub-urban Rail Transport** turned out to be both cost and time effective when compared to other modes of road transport.

2. METHODOLOGY

2.1. TRAIN JOURNEY TIME

This survey was conducted to find the time taken by the Suburban train to make one journey from **Yeshwantpur** Railway Station to **Anekal Road** Railway Station.

TABLE 1: Journey time of train survey

STATION	DISTANCE (IN KMS) (FROM YPR)	ARRIVAL	STOPPING DURATION (IN MINS' SECS")	DEPARTURE	REMARKS
YESHWANTPUR				14:57	
LOTTE GOLLAHALLI	4.47	15:08	1'20"	15:10	
HEBBAL	7.15	15:17	25'	15:42	Due to oncoming train
BANASWADI	13	15:48	2'	15:50	
BELANDUR	26.08	16:09	1'	16:10	
CARMELARAM	29.44	16:15	2'	16:17	
HEELALIGE	39.89	16:27	2'	16:29	
ANEKAL	49.97	16:40			

Total time of travel: 1hour 43minutes

Total Distance travelled: 50kms

Total travel time can be reduced if delay at Hebbal Railway Station is eliminated. Even if we were to provide a stopping duration of 2 minutes at every station, total travel time would be 1 hour 20 minutes only.

2.2. MOVING CAR OBSERVER METHOD

This survey was conducted to find out Traffic Flow, Running speed and Running Time. The survey began at **9:00AM** from **Yeshwantpur** Railway Station to **Anekal Road** Railway Station.

TABLE 2: Moving Car Method Survey conducted during peak hour

MORNING PEAK HOUR (Y-A)						
LOCATION	DIRECTION	JOURNEY TIME (in minutes)	STOPPED TIME (in minutes)	NUMBER OF VEHICLES		
				OVER TAKING	OVER TAKEN	IN THE OPPOSITE DIRECTION

YESHWANTPUR RAILWAY STATION TO ANEKAL ROAD	YESHWANTPUR - LOTTE GOLLAHALLI	19	0.27	7	5	258
	LOTTE GOLLAHALLI – HEBBAL	10	1.5	14	10	115
	HEBBAL – BANASWADI	29	11.5	31	52	373
	BANASWADI – BELANDUR	70	36	166	171	2173
	BELANDUR – CARMELARAM	33	9	38	29	352
	CARMELARAM – HEELALIGE	52	20	57	40	2525
	HEELALIGE - ANEKAL ROAD	17	0	1	9	185
	TOTAL	230	78.27			

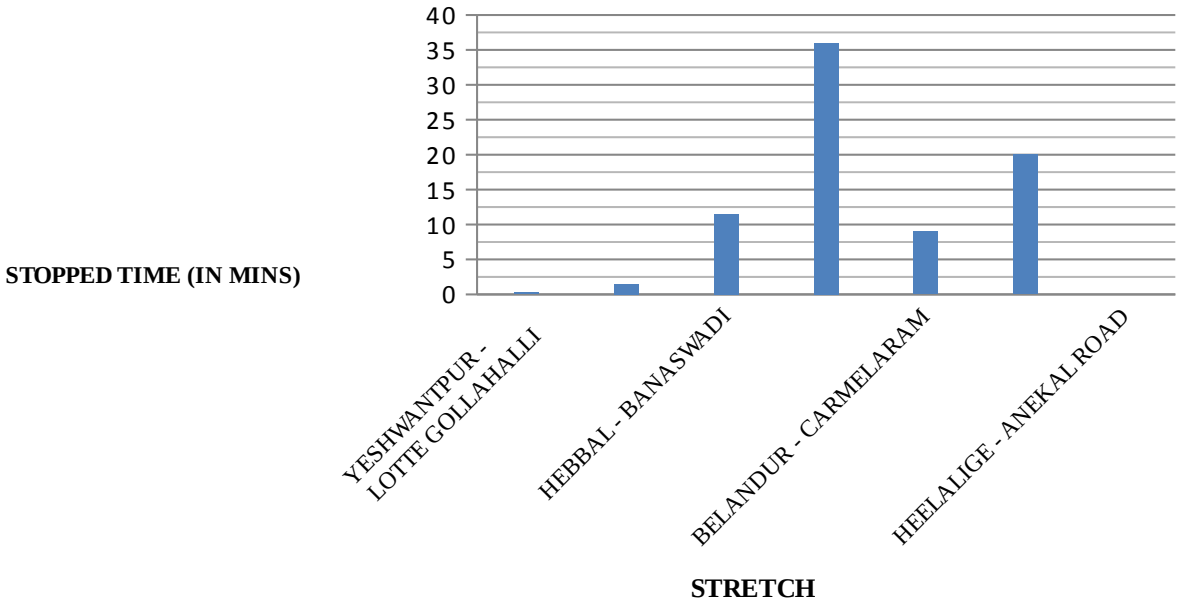

Fig 2: Graph of Stopped time at each interval

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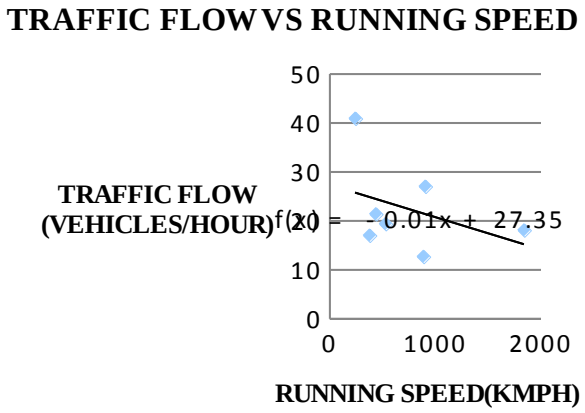

Fig 3: Traffic Flow vs Running Speed

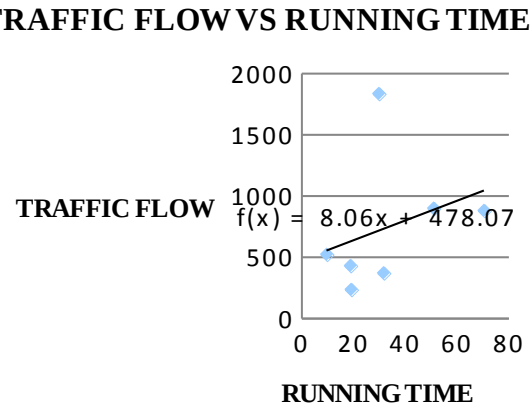

Fig 4: Traffic Flow vs Running Time

2.3. TRAFFIC VOLUME COUNT

This survey involved counting and categorizing of vehicles passing through **TIN FACTORY JUNCTION.** The data was expressed in terms of Vehicles per Hour and Passenger Car Unit (PCU) and used to calculate Level of Service of the road.

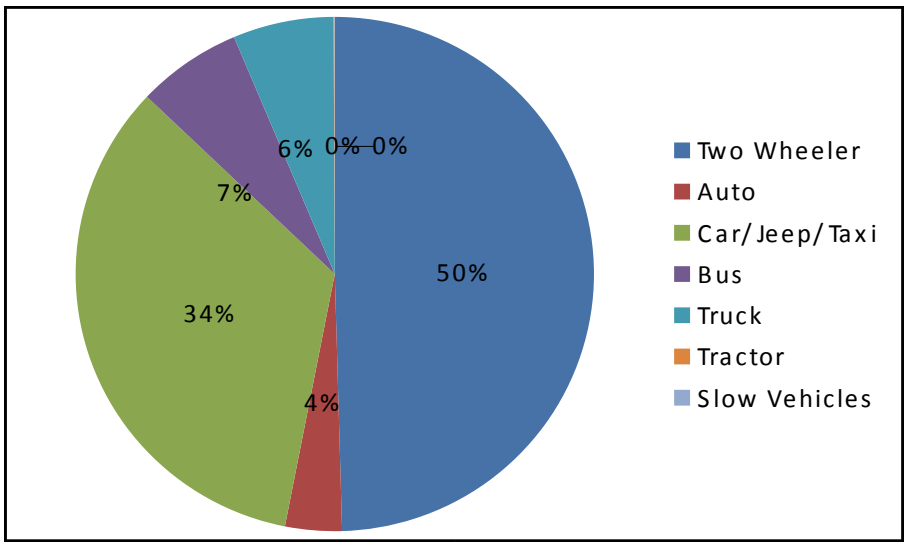

Fig 5: Traffic Composition at Tin Factory Junction

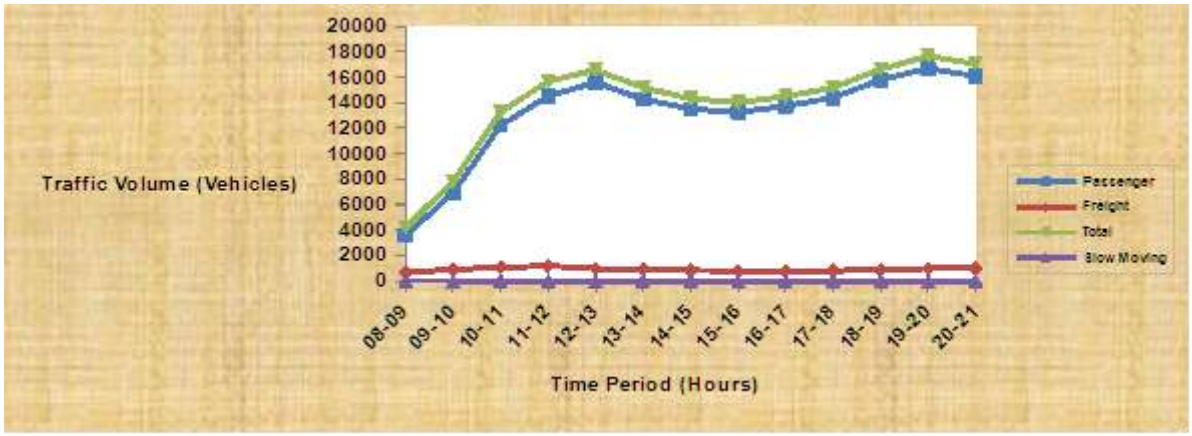

Fig 6: Hourly variation of traffic at Tin Factory Junction

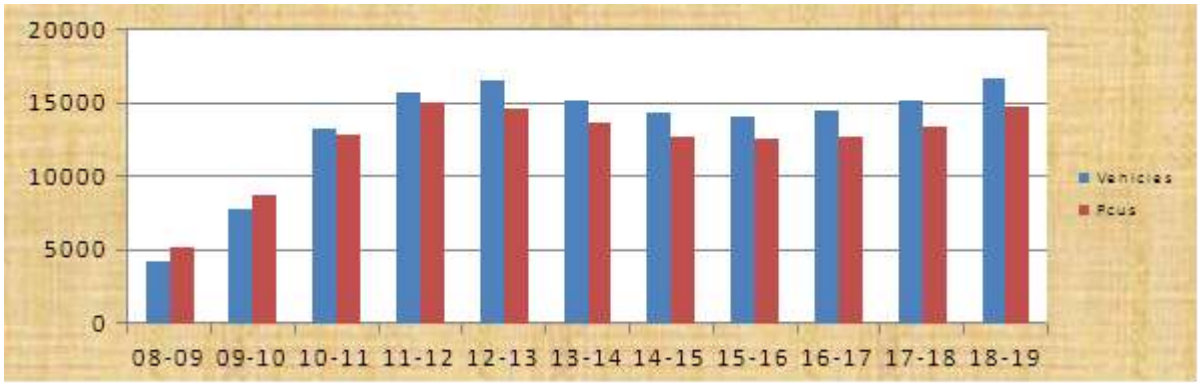

Fig 7: Hourly comparison of Vehicles and PCUs at Tin Factory Junction

TABLE 3: Calculation of Level of Service

DIRECTION	VOLUME (VEHICLES)	CAPACITY (PCUs)	VEHICLES /CAPACITY	LOS
BYPAPPANAHALLI, BENIGANAHALLI FLYOVER TO KR PURAM	78448	74607	1.051	F
KR PURAM TO BENIGANAHALLI FLYOVER,BYAPPANAHALLI	103572	92822	1.11578	F

Level of service **F** represents the region of forced flow, having low speed, and complete breakdown of the system. [1]1

2.4. ORIGIN AND DESTINATION SURVEY

Visits to **RMZ Ecoworld**, close to Bellandur railway station; **Manyata Techpark**, close to Hebbal railway station; **Bagmane Techpark**, close to Banaswadi railway station; **Electronic City**, close to Heelalige railway station and **Wipro Technologies**, close to Carmelaram railway station were made, and employees were asked to answer a questionnaire.

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[2] https://nptel.ac.in/courses/105101087/downloads/Lec-35.pdf

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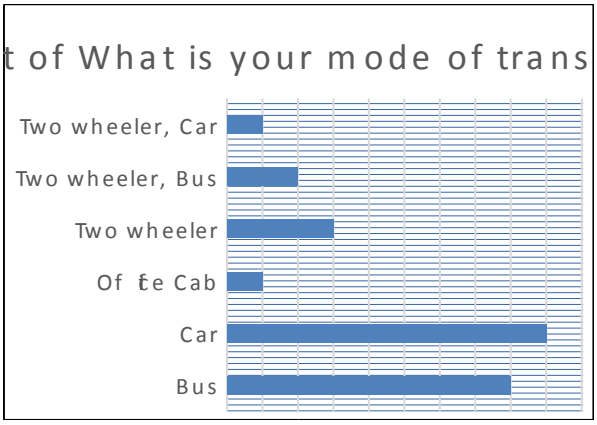


Fig 8: Modes of Transportation used

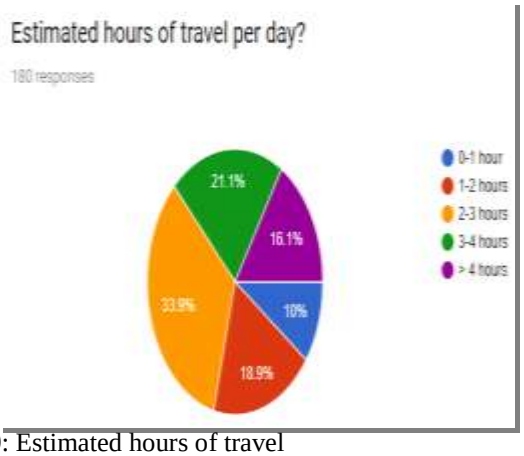
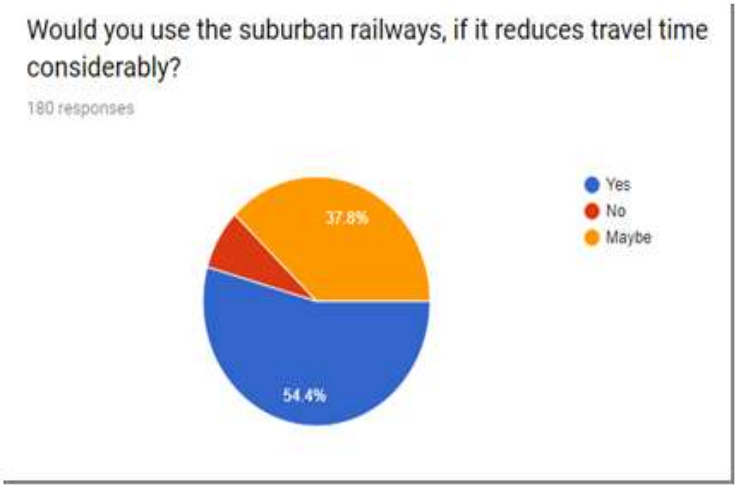


Fig 9: Estimated hours of travel



3. RESULTS AND DISCUSSIONS:

Comparison of cost:

Monthly cost of travel by train:

Average daily cost (including to and fro) = 30/-

Assuming that number of workdays in a month is 22.

Therefore, monthly cost of travel = 660/-

Assuming, 500/- per month as contingencies, i.e. last mile connectivity, etc.

Therefore, new monthly cost of travel = 1160 ≈ 1200/-

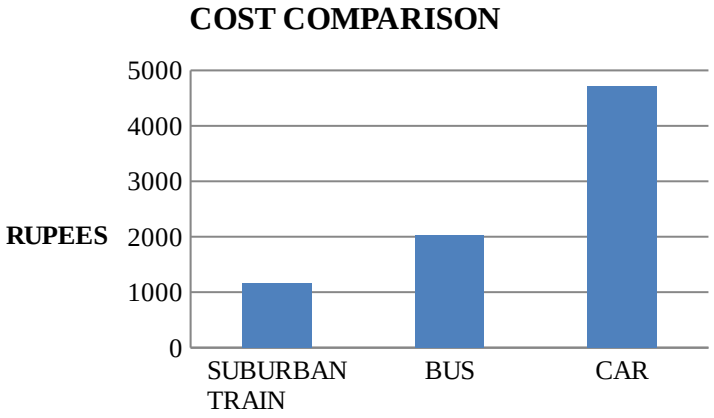
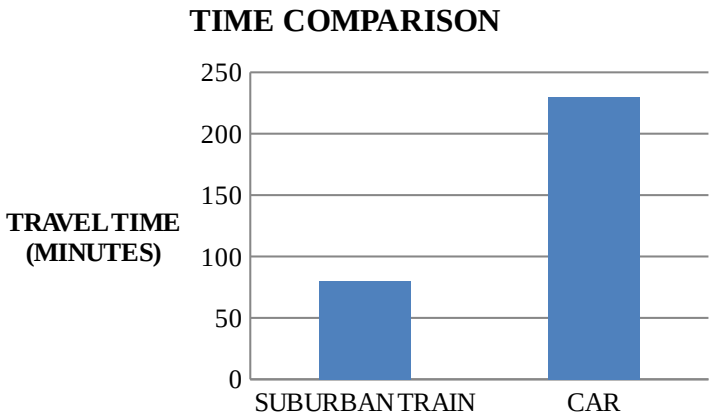


Table 4: Time and Distance comparison

MODE OF TRANSPORT	DISTANCE TRAVELLED (KMS)	TRAVEL TIME (MINUTES)
CAR	86.5	230
SUBURBAN TRAIN	50	80



4. CONCLUSION

From the Moving Car Observer Method, it was found that time taken by car is close to three times the time taken by train. From the Traffic Volume Count Survey, it was found that the roads have a Level of Service '**F**' which determines that the roads are being used beyond their maximum capacity which has led to huge traffic jams and longer hours of commute. Insight can be gained on travel patterns and travel choices from the Origin and Destination survey and an analysis of the obtained survey data proves that commuters are willing to use Suburban Rail Transport provided that there is an availability of trains during peak hours.

5. ACKNOWLEDGEMENT

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