

Analysis of Capacity and Level of Service of Parimpورا-Qamarwari Road and Chanapora-Rambagh Road, Srinagar, Jammu And Kashmir, India

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Abstract- India has most congested roads in the continent Asia and the distribution of traffic is uneven. Urban transportation is substantially contributing to the traffic congestion. Traffic jams on various roads in India cause huge inconvenience to commuters. With increase in population, day by day, more and more vehicles ply on roads. However, there is no expansion of roads due to road encroachment problems. In Srinagar city, for instance traffic jams during peak hours are witnessed on vital routes. These days people prefer to venture out in private vehicles which causes traffic congestion. Some roads in Srinagar are in dilapidated condition which also leads to traffic jams. The on-street parking and street vendors equally contribute to the traffic problems. In order to know the capacity (traffic flow) and level of service (LOS), two roads were taken into consideration viz- Parimpورا-Qamarwari road and Chanapora-Rambagh road. To have the knowledge of aforementioned roads, traffic survey was carried out to collect the data of road geometry, free flow, journey speed, delays etc. Vehicle count was done in peak and mid hour. It was observed that level of service of Parimpورا-Qamarwari road during peak hours was unstable and stable in mid hour. The level of service of Chanapora-Rambagh road was unstable during peak as well as in mid hour.

Key words; Congestion, capacity, level of service, traffic survey, free flow, journey speed, etc.

1. INTRODUCTION

The most dominant mode of transportation in India are roads. Most of the roads are truncated and contested with poor surface quality. Rapid urbanisation is being experienced in India. The southern and South-western parts of country have better transport infrastructure.

Maximum traffic volume allowed by a roadway per unit time is called its capacity. HCM (Highway Capacity Manual) coined the term Level of Service (LOS) in 1965. The qualities like speed, density, and delay are the outcomes of LOS evaluation. Letters A, B, C, D, E and F are six levels of services proposed by HCM. LOS A represents the free flow (best

quality) condition. Reasonable conditions are found when LOS is B. LOS letter C falls in the stable flow conditions. In LOS A, B and C, the driver comfortably drives the vehicle and there are very few chances of road mishaps. In LOS D, there is small increase in flow and the comfort level of driver is poor. Unstable flow conditions and breakdown conditions are observed when LOS is E and F respectively. Extensive queuing, breakdown and very low speed are found when LOS is F.

There is heterogeneous traffic in urban cities of India and the behaviour of traffic flow in such cities is very complex. [1] The capacity of roadway depends on lane width that is capacity of roadway has direct relationship with lane width. [2] The 0.3m and 0.6m lane widening corresponds to 14% and 24% in the increase in the capacity of roadway. [3] Road geometry and percentage of heavy vehicles depends on the evaluation of capacity and LOS. [4]

2. STUDY LOCATION

The two most congested roadways of Srinagar were taken into consideration in this study viz Parimpورا-Qamarwari road and Chanapora-Rambagh road. Latter is a single lane (two way) road and former is a two lane (one way) road. Chanapora-Rambagh road is one of the most congested roadway of Srinagar city. Electric poles are erected on the sides of road at different spots which contributes to traffic jams. The surface condition of Parimpورا-Qamarwari road is poor and the street vendors on the road is one of the causes of traffic congestion.



Fig 1. Qamarwari Rd



Fig 2. Study zone 1

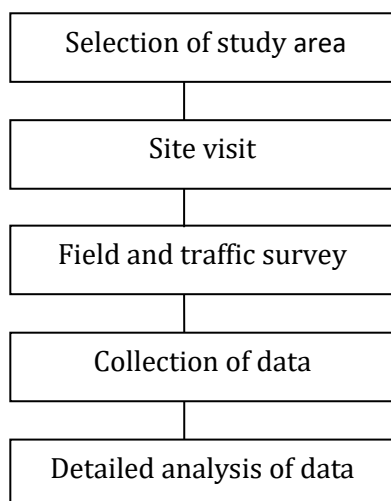


Fig 3. Rambagh Rd



Fig 4. Study zone 2

3. METHODOLOGY



3.1 DATA COLLECTION AND ANALYSIS

The data shown in the below given tables was collected from the Parimpora-Qamarwari Rd of Srinagar.

Lane 1 (Parimpora to Qamarwari).

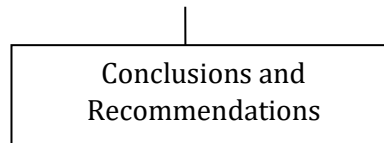


Fig 5. Flow chart of the methodology used in this study.

- The condition of roads of interest was observed by site visit. A detailed investigation was done to collect the information like lane width, number of lanes, surface conditions etc
- Various types of data were collected by field traffic survey such as vehicular count, journey speed, delays etc. Vehicular count was done manually and journey speed data was calculated by video graphic technique. A road stretch of length 200m was selected. Cameras were put on the extremes of road stretches to record the moment of vehicles.
- Maximum capacity was calculated by relation:

$$C = 1000.V/S$$

where C is the capacity of a single lane (veh/hr), V is the speed of vehicles (kmph) and S = Space headway (Average center to center spacing of vehicles) in meter. The minimum space headway is equal to minimum space gap (Sg) between the vehicles plus average length of a vehicle (L).

That is, $S = Sg + L$

Here, $Sg = 0.278 V.t$, where V is the speed in Kmph and t is the total reaction time of the driver, generally assumed to be equal to 0.70 to 0.75 sec.

Assume $t = 0.73$ and $L=6m$;

$$S = (0.2V + 6), m$$

- After knowing the volume and capacity of the the road, LOS was evaluated as;

$$LOS=V/C$$

Table 1. Data Collected at 9:30AM-10:30AM

VEHICLE TYPE	NO OF OBSERVATIONS (PCU/HR)	DISTANCE (M)	TIME (SEC)	SPEED (KMPH)	LOS (V/C)
Bus/Truck	261	200	91.50	07.85	1.022(F)
Car	653	200	80.66	08.89	
3W	189	200	77.16	09.32	
2W	177.5	200	50.00	14.04	

% Type of vehicle

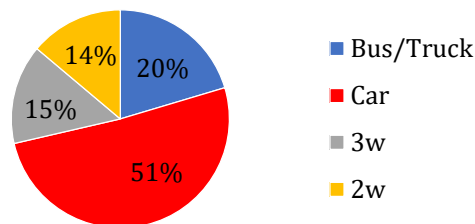


Fig 6.

Table 2. Data Collected at 11:45AM-12:45PM

VEHICLE TYPE	NO OF OBSERVATIONS (PCU/HR)	DISTANCE (M)	TIME (SEC)	SPEED (KMPH)	LOS (V/C)
Bus/Truck	243	200	32.60	22.06	0.448 (C)
Car	589	200	21.00	33.73	
3W	187	200	23.00	31.28	
2W	154	200	16.00	45.00	

% Type of vehicle

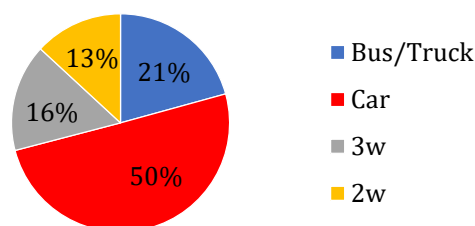


Fig 7.

Table 3. Data Collected at 4:00PM-5:00PM

VEHICLE TYPE	NO OF OBSERVATIONS (PCU/HR)	DISTANCE (M)	TIME (SEC)	SPEED (KMPH)	LOS (V/C)
Bus/Truck	234	200	72.20	09.97	0.739(E)
Car	615	200	53.33	13.50	
3W	152	200	59.0p	12.16	
2W	153.5	200	38.00	18.93	

% Type of vehicle

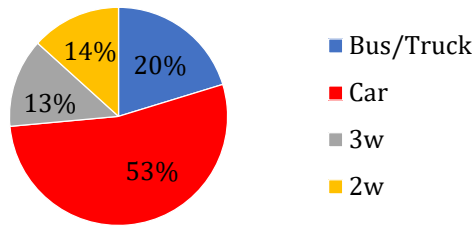


Fig 8.

Lane 2 (Qamarwari to Parimpora)

Table 4. Data Collected at 9:30AM-10:30AM

VEHICLE TYPE	NO OF OBSERVATIONS (PCU/HR)	DISTANCE (M)	TIME (SEC)	SPEED (KMPH)	LOS (V/C)
Bus/Truck	354	200	36.50	19.72	0.593(D)
Car	607	200	25.66	28.08	
3W	183	200	30.66	23.47	
2W	178	200	28.33	25.41	

% Type of vehicle

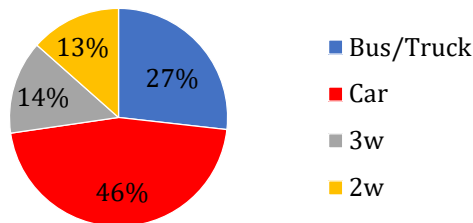


Fig 9.

Table 5. Data Collected at 11:45AM-12:45PM

VEHICLE TYPE	NO OF OBSERVATIONS (PCU/HR)	DISTANCE (M)	TIME (SEC)	SPEED (KMPH)	LOS (V/C)
Bus/Truck	429	200	29.40	24.48	0.463 (C)
Car	560	200	12.16	57.13	
3W	222	200	16.60	43.38	
2W	166	200	14.16	50.83	

% Type of vehicles

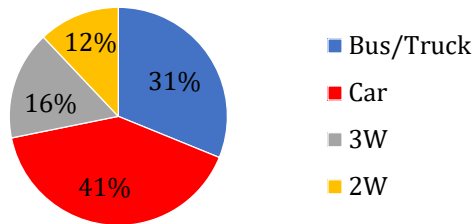


Fig 10.

Table 6. Data Collected at 4:00PM-5:00PM

VEHICLE TYPE	NO OF OBSERVATIONS (PCU/HR)	DISTANCE (M)	TIME (SEC)	SPEED (KMPH)	LOS (V/C)
Bus/Truck	294	200	92.00	07.81	1.013 (F)
Car	666	200	75.00	09.57	
3W	180	200	66.33	10.85	
2W	172.5	200	52.33	13.75	

%Type of vehicle

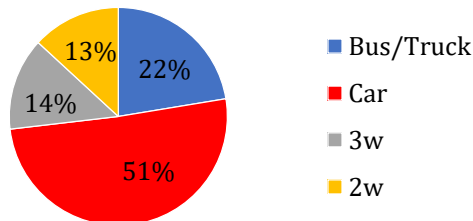


Fig 11.

The data shown in the below given tables was collected from the Chanapora-Rambagh Rd (Single lane, two way) of Srinagar.

Table 7. Data Collected at 9:30AM-10:30AM

VEHICLE TYPE	NO OF OBSERVATIONS (PCU/HR)	DISTANCE (M)	TIME (SEC)	SPEED (KMPH)	LOS (V/C)
Bus/Truck	18	200	54.75	13.14	1.149 (F)
Car	1163	200	35.00	20.55	
3W	259	200	48.91	14.68	
2W	550.5	200	47.16	15.26	

% Type of vehicle

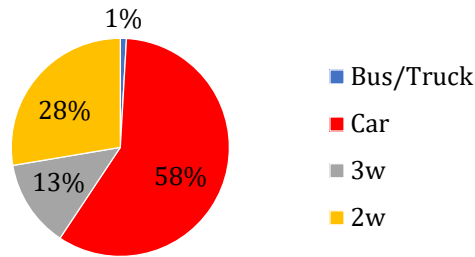


Fig 12.

Table 8. Data Collected at 11:45AM-12:45PM

VEHICLE TYPE	NO OF OBSERVATIONS (PCU/HR)	DISTANCE (M)	TIME (SEC)	SPEED (KMPH)	LOS (V/C)
Bus/Truck	11	200	45.75	15.73	0.732(E)
Car	931	200	30.66	23.47	
3W	278	200	30.75	23.40	
2W	365.5	200	24.74	29.08	

% Type of vehicle

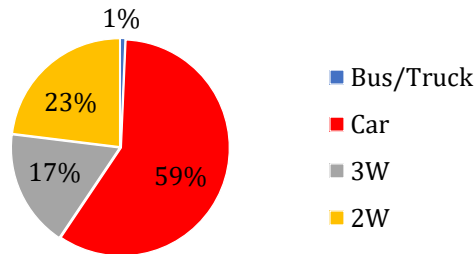


Fig 13.

Table 9. Data Collected at 4:00PM-5:00PM

VEHICLE TYPE	NO OF OBSERVATIONS (PCU/HR)	DISTANCE (M)	TIME (SEC)	SPEED (KMPH)	LOS (V/C)
Bus/Truck	18	200	46.99	15.30	1.172 (F)
Car	1195	200	42.91	16.77	
3W	286	200	44.16	16.27	
2W	474.5	200	57.25	12.56	

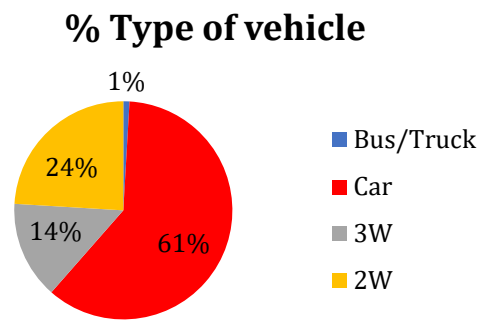


Fig 14.

4. CONCLUSIONS AND RECOMMENDATIONS:

Table 10. RESULTS

ROAD		LOS (MORNING)	LOS (MID)	LOS (EVENING)
Parimpورا-Qamarwari Rd (Two lane one way)	P to Q	F	C	E
	Q to P	D	C	F
Chanapora-Rambagh Rd (Single lane two way)	-	F	E	F

- LOS of Parimpورا-Qamarwari road was 1.022, 0.448, 0.739 at morning, mid and evening respectively for lane 1 (P to Q) and 0.593, 0.463, 1.013 at morning, mid and evening respectively for lane 2 (Q to P). Therefore, the quality of the road during peak hours was D, E and F and during mid hour, LOS was C and D. That means the traffic flow was unstable and stable in peak and mid hour respectively. The road condition should be improved, for instance patching should be done on the aforesaid road. Also the road should be widened to avoid the traffic jams.
- LOS of Chanapora-Rambagh road was 1.149, 0.732, 1.172 at morning, mid and evening respectively. Therefore, the LOS of the road during peak hours was F and during mid hour, LOS was E. That means the traffic flow in peak as well as in mid hour was unstable. Road widening and the median construction and diversion of poles from the road sides to other suitable spots are some of the solutions to avoid the traffic congestion problem of the Chanapora-Rambagh road.
- Traffic congestion from both the roads is avoidable by providing the separate space for street vendors and for parking of the cars.

5. References

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