Analysis of Traffic Congestion in Pulwama, Jammu and Kashmir, India

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Abstract- *Urban streets of developing countries like India confront a severe congestion scenario due to increasing imbalance in the volume of traffic. The chasm between demand and supply is the outcome of fast growing socio-economics of the people resulting in steep rise of vehicle ownership, accompanied by an unexpected slow development of transportation. Pulwama in India is one such city with the streets having lately experienced a sudden rise in traffic volumes. The situation is worsened by occupation of street space by hawkers, mobile shops, fast food corners, pedestrians, standing vehicles inter alia. This study focuses on analysing the traffic congestion scenario of the city streets and determining the influence of on-street parking thereby. Study area (Pulwama town) has been divided into five broad zones which are further divided into fifteen arterials and sub-arterials of road networks for precise study. Data was collected for traffic volume count, road geometry, pedestrian count, free flow and average travel speed, varying travel speed, travel time and travel cost at different links and major intersections. Household interview survey was also conducted. Roadway congestion index is the indicator used to quantify congestion. Indices of roadway congestion are separately determined for arterials and sub-arterials. Both the width and length of the street space occupied by parked vehicles have a great influence on traffic flow and hence volume to capacity ratio. The study also reports the levels of congestion on various links of both arterials and sub arterials. The results are expected to help the concerned authorities to a greater extent in framing and prioritising the improvement schemes.*

Key Words: Congestion, level of service, roadway congestion index, arterial, sub- arterial, Traffic volume, etc.

1. Introduction

Congestion refers to the delay travel time in excess of that normally incurred under free flow traffic condition. Traffic congestion in urban areas, is a major area of concern. When heavy traffic flow with high speed on national highways, results in traffic congestion when mixed up with local traffic at crossings. This results in many negative problems like pollution, delay, accidents and congestion at intersections. Traffic congestion in urban as well as sub urban areas has changed from mere annoyance to a severe problem. Road congestion is at its peak, movement of goods and people are slowing to a crawl and transportation cost is escalating. Urban congestion is broadly defined as excess demand for travel over its supply. Congestion, particularly that in urban areas affects free movement of traffic. As per situation in India, road traffic conditions are worsening day by day. The average number of vehicles in India is growing at the rate of 10.16% annually since last five years. As traffic congestion on Indian roads is not only due to increase in volume of traffic but it also depends upon other casual influences as well.

Fig 1. Traffic Congestion near District Court pulwama

Fig 2. Traffic Congestion near Rajpora Chowk Pulwama

2. SCOPE OF THE STUDY

The study aims at following: -

- ➢ It highlights the extent and causes of congestion.
- ➢ It models the effect of on-street parking on the volume - capacity (V/C) ratio and hence level of service (LOS).
- ➢ The study is dedicated to the central area of the Pulwama town which is the most congested area of the district.
- ➢ The study area has been divided into five zones with fifteen arterials and sub-arterials.
- ➢ Data is collected for traffic volume count, road geometry, pedestrian count, free flow and average travel
  speed, varying travel speed, travel time and travel cost at different links. In addition, household interview survey is also conducted.
- ➢ Roadway congestion index is separately determined for arterials and sub-arterials. The relationship between the ratio of volume to capacity and the ratio of street area occupied by parked vehicles to total area of street-space is also being modelled.
- ➢ It also locates the peak traffic volume in order to create an ease for people to change route during that time.

3. METHODOLOGY

3.1 SELECTION OF STUDY AREA

The study is dedicated to the central area of the Pulwama town which is the most congested area of the district. The study area was selected as the area with maximum traffic density on the basis of analysis done in first 10 days. It was observed that links from L1 to L15 were having maximum traffic congestion. Peak hour was determined after calculating flow for 2 consecutive days and thus determining the peak hour flow. It was seen that morning and evening junctures at 9am and 5pm were peak hour periods, but peak flow was slightly greater in the evening than in the morning.

3.2 Zones of the Study Area

The specifications of the zones are mentioned hereunder: -

Zone No.	Zone Name	Classification	Link Names
1	Nowgam-Pulwama Road	Arterial	L1, L2, L3
2	Shopian-Pulwama Road	Arterial	L4, L5, L6, L7,
3	Tahab-Pulwama Road	Arterial	L8, L9, L10, L11
4	Awantipora-Pulwama Road	Sub-Arterial	L12, L13
5	Rajpora-Pulwama Road	Sub-Arterial	L14, L15

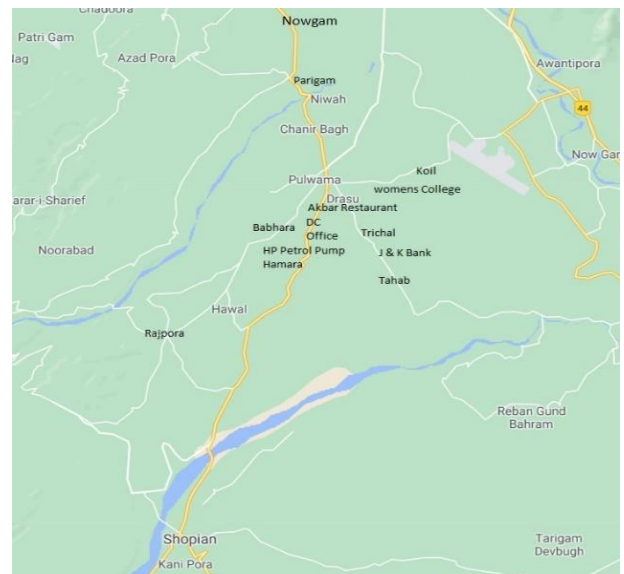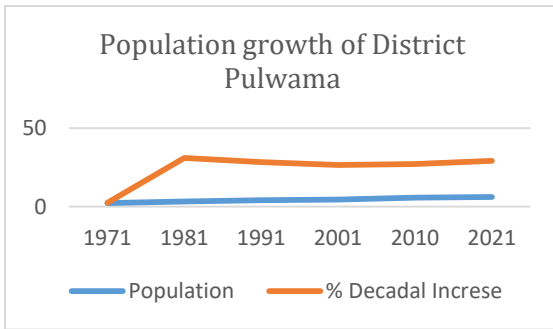Table 1: Specifications of various zones of study area

Fig 3. Zones of Study

3.3 POPULATION GROWTH

Population growth of Pulwama district from 1971-2021 is mentioned below: -

Year	Population	% Decadal growth
1971	2.136	31.00
1981	3.141	29.99
1991	4.040	28.39
2001	4.412	26.39
2010	5.604	27.00
2021	6.050	29.142

Table 2: Population growth of Pulwama district from 1971-2021 (lakh souls)

3.4 IDENTIFICATION OF STUDY LINKS

For the purpose of study, 15 links are considered, out of which 11 are arterials and 04 are sub arterials. These links are the most congested ones as per the analysis done.

3.5 DATA COLLECTION

3.5.1 TRAFFIC VOLUME COUNT

The extent of variation of traffic flow and the identification of peak hour was done by carrying the traffic volume study on 4 identified links, at different points P1, P2, P3, P4 from 7AM to 7PM for three-week days. The peak hours were at 9:00-10:00am and 4:00-5:00pm. Congestion on all links in evening peak was found to be greater than that during morning peak. Traffic volume count (PCI/h) was taken at 15 identified links of study during the identified peak hour only.
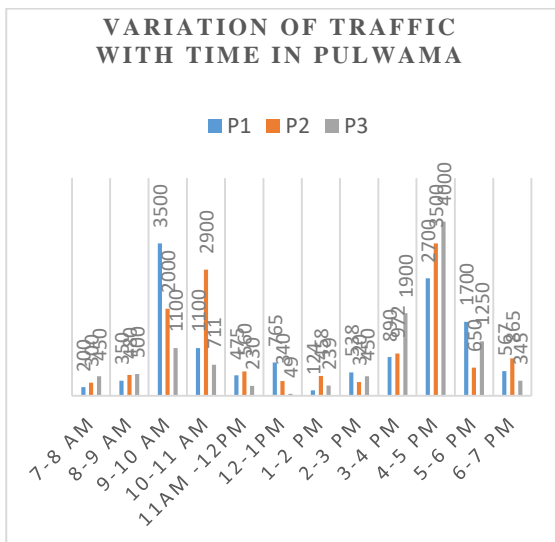

Fig 3. Variation of Traffic with time

4. CONGESTION QUANTIFICATION

Congestion was quantified using Roadway Congestion Index (RCI) using the same procedure as given in the Highway Manual Capacity. RCI is calculated by the following equation: -

$$RCI = \frac{\frac{\sum Volume\,per\,peak\,factor\,x\,(Vehicle\,per\,peak\,hour\,x\,link\,length)}{link\,capacity}}{\sum(Volume\,per\,peak\,hour\,x\,link\,length)}$$

The level of service, as defined by Highway Manual Capacity, a US based document is a semi qualitative measure for describing the operating conditions for a traffic stream as it is felt and perceived by drivers/passengers from the use of roadway section.

Highway Manual Capacity suggests that the qualitative classification of traffic is to be done in the of a six A-F level of services (LOS). It is seen that all the links have F level of service having an average RCI equal to 1.59 i.e., the worst congestion scenario. The graphs, charts and table revealing all the data are drawn below: -

Roadway Congestion Index

RCI
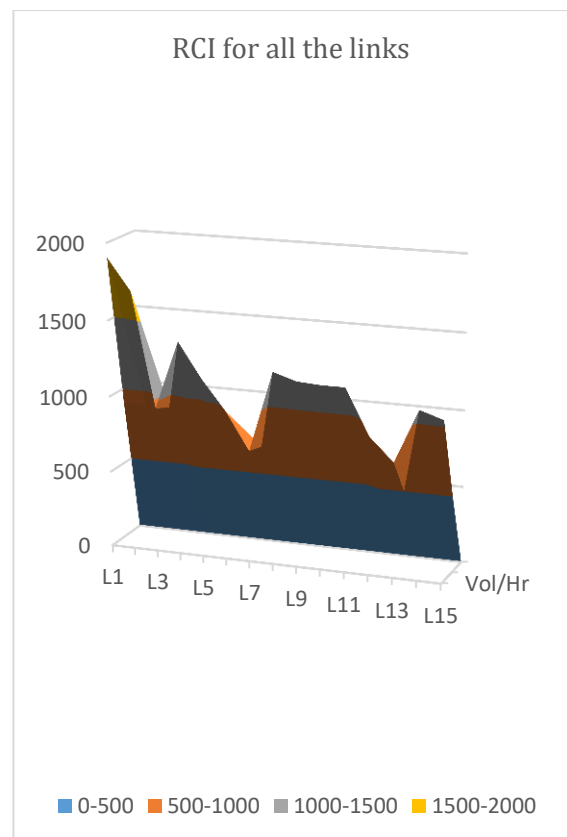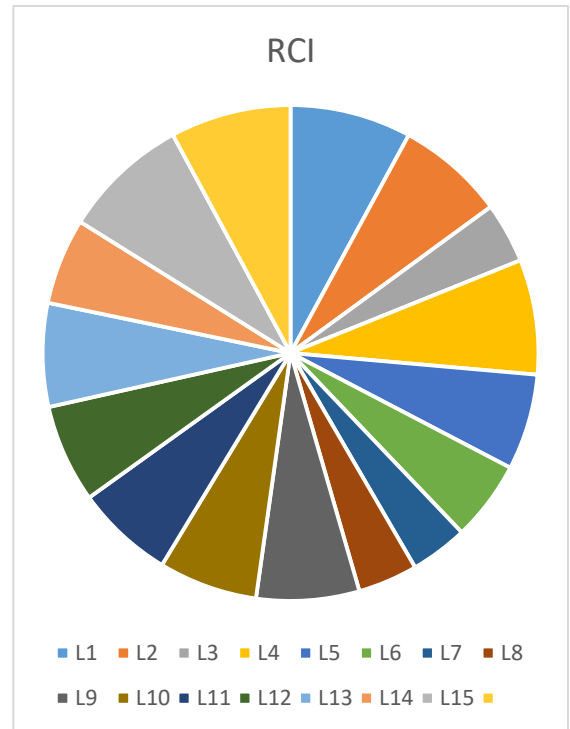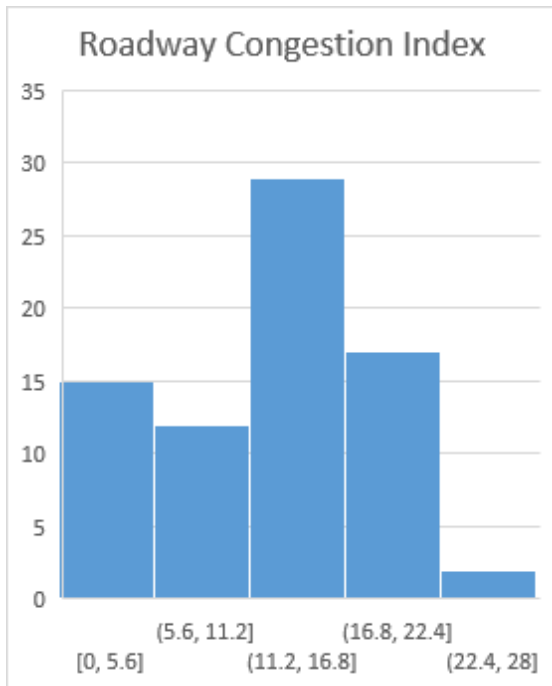
Link No.	Link Name	Link Type	Vol/Hr	Capacity (C)	Link length (L) (Km)	Width	RCI	LOS	Avg. RCI
L1	Rajpora Chowk to District Court Pulwama	Arterial	1906	900	0.95	15.00	2.11	F	
L2	District court Pulwama to Newa	Arterial	1700	900	6.10	7.50	1.88	F	
L3	Newa to Parigam	Arterial	950	900	4.20	7.50	1.05	F	
L4	Rajpora Chowk to Akbar Restaurant	Arterial	1400	700	0.50	15.00	2.00	F	
L5	Akbar Restaurant to DC office pulwama	Arterial	1170	700	1.00	7.50	1.67	F	1.59
L6	DC Office to HP Petrol Pump Hamara	Arterial	977	700	2.00	7.50	1.39	F	
L7	Hp Petrol Pump Hamara to Azka Crockery Hub	Arterial	730	700	1.25	7.50	1.04	F	
L8	Rajpora Chowk to Drasu	Arterial	1258	700	1.50	7.50	1.79	F	

L9	Drasu to Trichal	Arterial	1210	700	0.75	7.50	1.72	F	
L10	Trichal to J & K Bank	Arterial	1200	700	1.25	7.50	1.71	F	
L11	J & K Bank to Tahab	Arterial	1200	700	1.50	7.50	1.71	F	
L12	Rajpora Chowk to Womens College	Sub-Arterial	900	500	0.9	3.75	1.80	F	
L13	Womens College to Koil	Sub-Arterial	750	500	5.7	3.00	1.50	F	
L14	Rajpora Chowk to Babhara	Sub-Arterial	1100	500	3.0	3.50	2.20	F	
L15	Babhara to Rajpora	Sub-Arterial	1050	500	3.5	4.50	2.10	F	

Table 3. RCI and LOS for links from L1 to L15

5. Conclusions and Recommendations

The following conclusions have been revealed from the study: -

- ➢ Traffic in Pulwama town has reached its stupendous proportions resulting in severe congestion on roads.
- ➢ The average roadway congestion of 1.59 manifests the severity of Traffic Congestion.
- ➢ People face a lot of problems for want of implementation of facility proposals, if any at Government level.
- ➢ The daily travel time along all stretches increases during 9:00 AM to 10:00 AM and 4:00 PM to 5:00 PM.
- ➢ There is no proper designation of intersections and signal has not yet been adopted.
- ➢ Most of the roads are single lane roads with narrow footpaths which results in grid locking thereby leads to congestion of the Traffic.
- ➢ The drainage system is in its poorest state. This also creates havoc during rains.

The study proposes the following recommendations:

- ➢ Roads are to be widened as per the new policy of IRC.
- ➢ Multilevel Parking facilities should be provided atleast at three places:

1- Around hospital on Pulwama – Nowgam road.
2- Around Police lines on Shopian-Pulwama road.
3- Around Government Higher Secondary School Pinglena on Pulwama-Srinagar road.

- ➢ Widening of footpaths is to be ensured so that pedestrians do not use the carriageway.
- ➢ There should be four to five rotaries in order to control the congestion scenario.
- ➢ Traffic signals can prove helpful in tackling the congestion of traffic by controlling the volume on different roads. Traffic signals are suggested at Rajpora Junction.
- ➢ Drainage system should be rectified and proper sewerage system is to be provided, so that runoff water do not flow over roads and movement of vehicles is not disturbed.
- ➢ Hawkers and Cart vendors, floating shops, inter alia to be relocated at appropriate areas.
- ➢ Parking on footpaths and roadsides should be prohibited within a radius of 1.5 Km from Rajpora Chowk and implemented in letter and spirit.
- ➢ Adequate number of zebra crossings need to be provided for safe movement of pedestrians.

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