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Analysis of Traffic Congestion Characteristics for M.G. Road, AGRA

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Abstract— *As we see that world's population is increasing rapidly day after day. Increasing population increases the vehicle use. So, now traffic congestion has become a major issue now a day. Traffic congestion is the Consequence of the gap between transportation sector demand and supply. It can be uttered that traffic jam is killing our time only, it will be wrong. Traffic congestion can be accountable for affecting our health.*

Traffic congestion is acting as hurdle to Evolution of any country as it impacts and generate a huge amount of economic cost and so on. Due to traffic congestion, companies that are consultancies related with the transport system engineering are not achieving their targeted profit. We as a team perceive there is a vital demand of proper traffic management facilities on M.G Road, Agra, Uttar Pradesh. In order to carry out the consequences which are responsible for traffic congestion, we need to study the Traffic Data and its Characteristics so that we can upgrade the traffic facilities. We analyzed data from different sections and by conducting different field Surveys. Subsequently we accomplished what is the contrast of PCU (Passenger Car Unit) with a certain time and then we correlate all these data with the design capacity of the Road. In addition to this we have carried out that how much the lane or road capacity is affected due to the improper traffic practices. Mentioned studies Indicate useful information concerning the entire traffic management system including the Aim which helps to reach Sustainability. It also provides useful information to the traffic researchers and policy makers for designing, planning, and evaluating traffic management system.

Keywords— **PCU (Passenger Car Unit), Design capacity, Congestion, Delay**

INTRODUCTION

With the boosting up of industrialization in the entire world results in much elevated growth rates of built-up economy, remuneration as well as the way of life of the occupants in consideration with the high growth rate of resident, there is exponential growth in the exclusive vehicle ownership. Our researcher claimed that population growth and increasing Way of life results in major consequences for the growth in count of vehicles irrespective cities. In context to the reasonable amount of small city cars. In this modern growing world, most people favor to travel by individual cars over public transportation system. Recent developments such as multi-tiered transportation systems provide sufficient space so that traffic congestion will not occur.

Several Research designates that the mean volume of traffic related to congestion due to practicing improper traffic flow and pattern which includes irrelevant parking of vehicles during peak time can reach 30%–50% of total traffic. Hence, it is necessary to carry out the demand assessment for traffic flow in effected regions of the area to implement appropriate traffic management policies. Ample research and studies have been carried out on different Situation and various framework of different cities in the world comprising varied Traffic Engineering parameters and characteristics. Most of the studies concerns and proceed towards traffic management models over the past years.

The common things that have been Integrated in the most studies are the distance to be travelled and journey time. In this paper, a review of various studies of past few decades regarding the traffic Characteristics and analyzing of traffic demand with developed models have been presented. Every individual who owns a vehicle will contribute in traffic. As the number of vehicles grow, the traffic Characteristics needs to be updated. According to the Ministry of Road Transport and Highways, there is exponential growth in motor vehicle count of nearly 300% from 550 lakhs in 2001 to 2100 lakhs in 2015 in India. The growth rate of motor vehicles is even higher for Metropolitan cities like Delhi, Bangalore, Mumbai, Kolkata etc.

Road intersections comprises of many conflict points depending on the number of lanes. This results, as we see at intersections, vehicular flows from different directions meets having either left-hand turn, and or right-hand turn movement tends to busy the same available area or space at the same instant. Furthermore, to these traffic-vehicular flows,Walking people seeks to use this area to cross the particular road and which in turn making the SCENARIO worse which comprises of already bad traffic situation.

In the present scenario AGRA city also falling under prevailing such condition. Major intersections of the city are much badly affected by traffic congestion which results in various hazard and travel delays so there is big need to conduct study on traffic congestion and traffic characteristics road intersections.

The main objective of the study is to measure effective congestion at considered sections by applying engineering techniques.

STUDY AREA

The M.G. (Mahatma Gandhi) Road is one of the prime and important road networks which covers Agra, comprising most vehicle populated or busy road connecting NH-19 and NH-44. The Analyzed area comprising some major sections of this road named-

- First Section (Diwani crossing to Sursadan Tirtha)
- Second Section (Sursadan Tiraha to Hariparvat Crossing)
- Third Section (Hariparvat Crossing to St. Johns Crossing)

M.G. road consists of two ways with 6.55 meter of road width at Diwani crossing, 7m at Sursadan Tiraha and Hariparvat Crossing, 7.5-meter width at St. Johns Crossing.

The studied section has a capacity of approx. 8000 PCU/hr.

The study area consists of total 1.65 km stretch starting from Diwani crossing to St. Johns Crossing.

DATA COLLECTION

Data is taken from Agra Nagar Nigam office

A. Traffic Flow

Determination of traffic flow data in this particular research study is done by application of standard video recording practices of Agra Development Authority Cameras and with rigorous field surveys. This comprises of the whole count of the Standard vehicles in recorded mean time during the peak hours of traffic flow.

B. Speed

In Traffic Engineering, Speed could be analyzed in three different ways

- Space mean speed
- Time mean speed
- Spot speed

Space-mean speed is characterized as the normal of speed estimations at a specific moment of season of all vehicles over a specific stretch of the parkway.

Time-mean speed is characterized as the normal of the speed estimations at one point in space of the relative multitude of vehicles disregarding a timeframe.

In this study time mean speed or the average speed has been taken out from, consideration from the video recordings data and percentage cumulative vehicles distributed over the entire considered section. Overall, this method of obtaining the speed of any vehicles is easy to apply, economical and collected data can be subjected to statistical procedures

Travel time information is extremely urgent to compute traffic congestion, time taken to travel a especially known length of segment is estimated for each kind of vehicle. The information incorporates travel time during free-stream condition and peak hour stream at congestion like circumstances. This is absolutely a manual and field perception strategy however video accounts additionally can be helpful now and again.

C. Geometric Characteristics

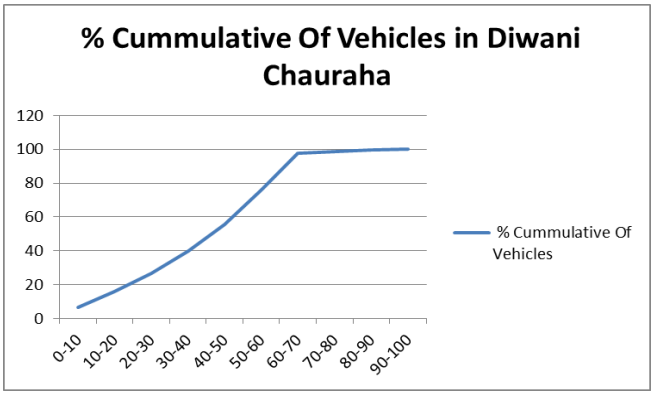
Geometric estimations were acquired in the field by the method for basic tape estimation. The level of precision was closest to 10 cm. The data were recorded in the rough notebook.

D. Data analysis

Table-1. JUNCTION:-DIWANI_CHAURAHA

PCU/day:-23,694

Speed Range	Number of Vehicles	Minimum speed	Percentage of Vehicles	Cumulative Percentage
0-10	1578	5	6.66	6.66
10-20	2173	15	9.17	15.83
20-30	2597	25	10.96	26.79
30-40	3076	35	12.98	39.77
40-50	3761	45	15.87	55.64
50-60	4797	55	20.25	75.89
60-70	5118	65	21.60	97.49
70-80	278	75	1.17	98.66
80-90	175	85	0.74	99.4
90-100	141	95	0.60	100

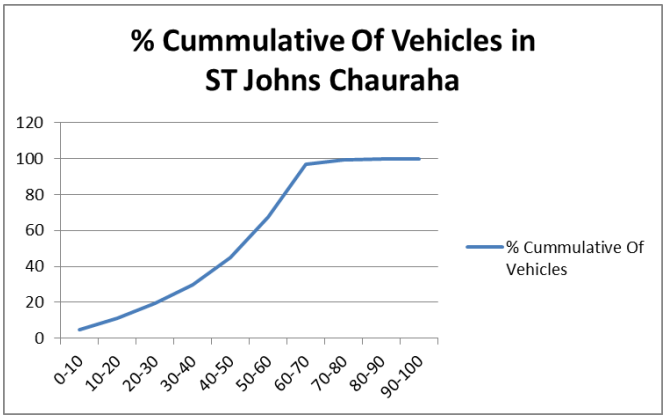


Graph-1. Cummulative of vehicle in Diwani Chauraha

Table-2. JUNCTION: - ST_JOHNS_CHAURAHA

PCU/day:-122,266

Speed Range	Number of Vehicles	Minimum speed	Percentage of Vehicles	Cumulative Percentage
0-10	5794	5	4.74	4.74
10-20	7545	15	6.17	10.91
20-30	10237	25	8.37	19.28
30-40	12579	35	10.29	29.57
40-50	18681	45	15.28	44.85
50-60	27956	55	22.87	67.72
60-70	35976	65	29.42	97.14
70-80	2457	75	2.00	99.14
80-90	842	85	0.70	99.84
90-100	199	95	0.16	100

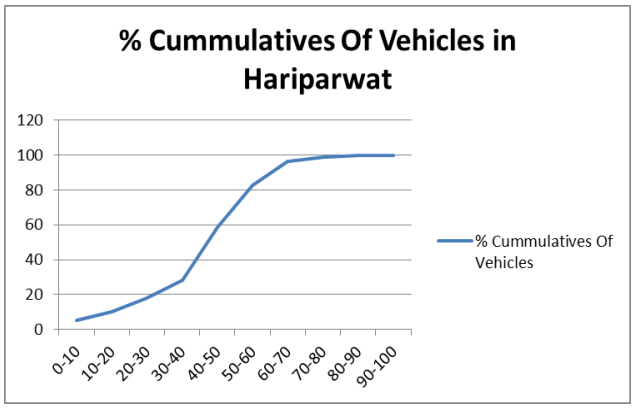


Graph-2. Cummulative of vehicle in ST Johns chauraha.

Table-3.JUNCTION: - HARIPARVAT_CHAURAHA

PCU/day:-261,522

S.NO.	SPEED (Km/h) INTERVAL	No. of Vehicles	% Vehicles	Cumulative % Vehicles
1	0-10	12576	5	5
2	10-20	12601	5.01	10.01
3	20-30	20122	8	18.01
4	30-40	36335	10.47	28.48
5	40-50	75456	30	58.48
6	50-60	60365	24	82.48
7	60-70	35213	14	96.48
8	70-80	5307	2.11	98.59
9	80-90	3547	1.41	100

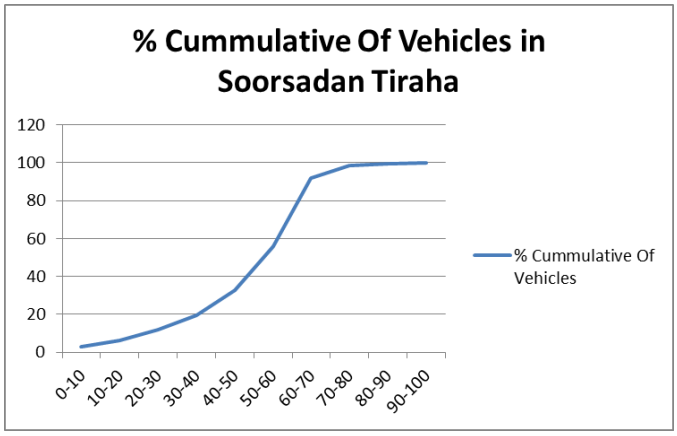


Graph-3. Cummulative of vehicle in Hariparwat

Table-4. JUNCTION: - SOORSADAN_TIRAHA

PCU/day:-197,670

S.NO.	SPEED (Km/h) INTERVAL	No. of Vehicles	% Vehicles	Cumulative % Vehicles
1	0-10	5680	2.87	2.87
2	10-20	6560	3.32	6.19
3	20-30	11330	5.73	11.92
4	30-40	14690	7.43	19.35
5	40-50	26320	13.31	32.66
6	50-60	45910	23.32	55.98
7	60-70	71480	36.16	92.14
8	70-80	12300	6.22	98.36
9	80-90	3400	1.64	100



Graph-4. Cummulative of vehicle in Soorsadan Tiraha

Table-5. Traffic Flow Characteristics.

Stretch Name	No. of vehicles	Distance (m)	(V) Design Speed (Km/h) (Taken from graphs drawn- 98% Speed)	(K) Traffic Density (V/Km) (Taken for Average of both way vehicles)	(Q=KV) Traffic Flow (V/h)
Diwani to Sursadan	51	700	61	76.4	4660
Sursadan to Diwani	56	700	61	76.4	4660

Table-6. Traffic Flow Characteristics

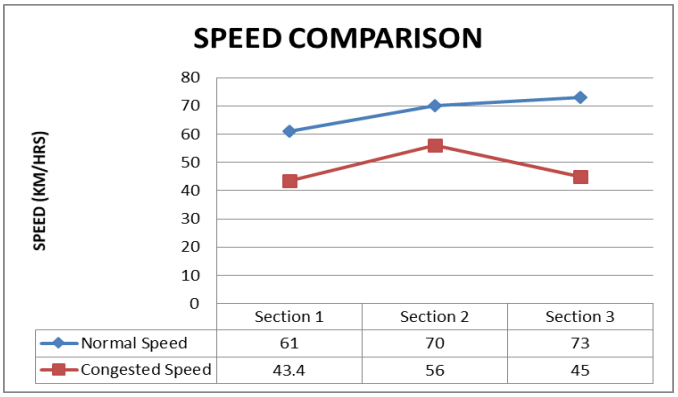
Stretch Name	No. of vehicles	Distance (m)	(V) Design Speed (Km/h) (Taken from graphs drawn- 98% Speed)	(K)Traffic Density (V/Km) (Taken for Average of both way vehicles)	(Q=KV) Traffic Flow (V/h)
Sursadan to Hariparvat	60	550	70	122.7	8589
Hariparvat to Sursadan	75	550	70	122.7	8589

Table-7. Traffic Flow Characteristics

Stretch Name	No. of vehicles	Distance (m)	(V) Design Speed (Km/h) (Taken from graphs drawn- 98% Speed)	(K) Traffic Density (V/Km) (Taken for Average of both way vehicles)	(Q=KV) Traffic Flow (V/h)
Hariparvat to St. Johns	53	400	74	123.8	9160
St. Johns to Hariparvat	46	400	74	123.8	9160

RESULTS AND DISCUSSION

The process to estimate the traffic congestion, measurement of traffic flow in the section should be carried out accurately. The travel time analysis also plays a crucial role in this case. The proper analysis of traffic and design of the road should thoroughly study to make an effective conclusion which may further used for future design and implementation. Before proceeding to the analysis part there need to be discussed some conceptual definitions and theory related topics



Graph-5. Speed comparison.

E. Delay Analysis

	Diwani crossing to Soorsadan Tiraha	Soorsadan Tiraha to Hariparvat Crossing	Hariparvat Crossing to St. Johns Crossing
Vp	7200 pcu/hr	9400	8150
Ta	42 sec	29 sec	20 sec
Tc	58 sec	35 sec	32 sec
D	10,8776.1652	71,110.6104	80,320.09415

Table-8 DELAY ANALYSIS

$$D = -19176.4+3738.815 * Tc – 2922.22 * Ta + 4.699241* Vp$$

Where,

$\boldsymbol{D}$ = Segmental delay (Vehicle-second), $\boldsymbol{D'}$ = Segmental delay (person-second),

$\boldsymbol{Ta}$=Acceptable travel time over a defined section (second), $\boldsymbol{TC}$ = Congested travel time over a defined section (second),

$\boldsymbol{VP}$ = Vehicle volume in peak period (PCU/hr.),

PHOTOS DURING FIELD SURVEYS

CONCLUSIONS

- Hariparvat Section accommodates the highest of traffic flow among all the sections.
- Hariparvat to St. Johns Stretch lowest speed has been analyzed during congestion.
- Diwani Section has less a flow of traffic than Hariparvat Section.
- Segmental delay is maximum at Hariparvat to St. Johns Stretch.
- Soorsadan to Hariparvat has favourable flow condition

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BIOGRAPHIES

Ayush Saxena is a Senior Undergraduate Student in the Department of Civil Engineering at Dayalbagh Educational Institute (DEI) in Agra. He is interested in Transportation Engineering and has been trained on design software such as STAAD Pro and AutoCAD. He worked on a number of projects associated with DEI. Also, he completed his internship at JSW group with numerous industry projects

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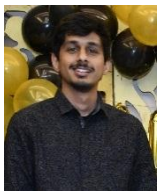
Rananjay Pundhir is a Hard working civil engineering graduate carrying ,impactful knowledge of practical exposure of construction field.



Madhav Dixit, Pursing His Bachelor's Of Technology In Civil Engineering From Dayalbagh Educational Institute , Agra. He has a good command on civil engineering software's like STAAD.PRO , STAAD FOUNDATION , AUTOCAD 3d, 2d and also worked over different project like High rise buildings , Concrete design etc

Shivansh, pursuing bachelor degree in civil engineering from Dayalbagh Educational Institute, Agra. I worked on a road construction project in PNC Infrastructure as intern.

Sachin Dhangar. Currently I am perusing B.Tech in civil engineering from Dayalbagh Education Institute