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A Study of Traffic Stream Characteristics on National Highway Under Heterogeneous Traffic Conditions

Rayan Raees Ahmad[1], and Richika Rathore[2]

[1]M.Tech Scholar, Department of Civil Engineering, RIMT University, Mandi Gobindgarh, Punjab, India
[2]Assistant Professor, Department of Civil Engineering, RIMT University, Mandi Gobindgarh, Punjab, India

Correspondence should be addressed to Rayan Raees Ahmad; rayan6741@gmail.com

ABSTRACT- The Statistical representation of the complex traffic flow system for the cause of distinguishing as well as forecasting the functioning of traffic is known as Traffic flow modelling. The principal basis of several traffic flow models is represented by traffic stream models. Traffic stream models show us the basic interrelationship among the three basic traffic flow variables i.e., speed of vehicle, flow of vehicle and density of vehicles. Interpretation of the traffic flow variables, their interdependence and approach to model traffic are extremely crucial in the designing, operating and planning of transit systems. Numerous ground work research has been done recommending various traffic stream models. Designing of transit systems is a complex problem and includes various key parameters like: road type, road width, width of vehicle, Cross-section of road, Number of lanes etc. Designing of roads takes place according to the recommendations of Indian Road Congress. In this paper various values obtained from observations on local data were done involving traffic flow. The purpose of this research is to study and examine the traffic flow on lanes in order to explore a model which will allow continuous movement of traffic on the National Highway. A realistic perception of traffic flow pattern for such crucial roads is important for traffic functioning, organizing and administering for assuring the maximum level of service. Using elementary framework of traffic flow for the choice and location of selected road, width of road, sample time, survey of traffic, video recordings of traffic, as well as statistical inquiry and figuring of basic parameters of traffic flow has been done. This study will be done under the heterogeneous conditions of traffic on national highways and the values of various traffic flow variables will be extracted. These constants will help us in obtaining a link between various flow parameters like vehicle density, vehicle volume, vehicle speed etc., and in turn help us in obtaining graphical relations between various traffic parameters for the traffic network. This will help us in developing the theoretical relationship between various traffic flow variables which will in turn enable us to model for current roads.

KEYWORDS- Traffic Flow Modelling, Traffic Stream Modelling, Traffic Flow Characteristics, Traffic Parameters, Heterogeneous Traffic Conditions, Regression Analysis

I. INTRODUCTION

The purpose of traffic flow characteristics and their distribution in the recorded region in terms of space and time is established in the forecasting and design of transportation infrastructure. It is crucial to perform research on pertinent traffic flow metrics under various conditions on the observed road network in order to select the best solution for the projected duration. This study then makes it possible to choose the best traffic flow model. The idea of "traffic flow modelling" [1] refers to the definition of relationships between the three primary components of traffic flow: volumes, density, and speed. Based on surveying the traffic samples, or samples on important parts under typical peak and off-peak loads, the values of traffic parameters are determined. The sampling method that is most frequently used involves measuring the amount of traffic flow, or doing traffic counts. Even if it is accurate, this approach is insufficient to determine the real and available capacity of future roadways because this capacity is largely dependent on the particular traffic operating circumstances on the road infrastructure. Only after the road has been built can a traffic count provide accurate data on a route's capacity and infrastructure. Therefore, in order to define road capacity in planning that will satisfy the requirements of the future infrastructure, measurements must be made involving coefficients and factors must be calculated.

Road capacity is a crucial element in all phases of developing and computing design solutions, in addition to traffic flow indications. The primary sign of a reasonable and well-considered policy for road maintenance and building is capacity. It directly not only influences the selection of road design, cross-section and its components, but it also affects vehicle operating expenses through the submission of proper access road designs. When designing a Road cross-section based on projected traffic levels, the best peak hour traffic volume should be determined using the important planning technique known as road capacity. Road design uses descriptive thermal efficiency from the worldwide standard, with values obtained using empirical techniques from local information on traffic flow.

I had performed research in the Lethpora region, which is on NH-44, in order to create a significant traffic model that will allow for a more suitable and appropriate description of local characteristics of traffic flow that flows on the National Highway. Measurements of fundamental traffic

stream characteristics [2] and computations of the values of pertinent coefficients corresponding to the types of roads in the observable road network will be made.
The objectives of the study are as follows:

- Measure vehicle spot speeds and take note of other traffic factors.
- Calculating various traffic quantities.
- Calculating the hourly volume in PCUs (passenger car units) and choosing the right vehicle design for the flow of traffic.
- Considering the traffic in question's macro factors, such as space and time headway [3].
- Creating a model using the National Highway specifications.
- Measuring the National Highway's congestion density.
- Estimating the National Highway's free-flowing vehicle speed.

II. LITERATURE REVIEW

There are numerous studies that have been published regarding the advancement of traffic stream models that show how the properties or data [5] of the traffic stream vary from location to location. It is quite simple to create such models for a uniform traffic flow, however India's traffic circumstances are significantly different. The macro traffic stream characteristics have a significant impact on how the road network system is planned and designed.

A. ThamizhArasan and Reebu Zachariah Koshy (2005)

A technique was devised related to modelling extremely heterogeneous traffic flow which was published in their article namely "Methodology for Modelling Highly Heterogeneous Traffic Flow." The modelling of extremely diverse traffic flow, the entire road area would be suitable to be considered as a single unit and vehicles were considered as rectangular blocks on the road surface. It has been discovered that it helps to accurately replicate the field circumstances of mixed traffic flow of cars at the road surface and using a coordinate system to update those positions with respect to a point of origin. Based on the headway distribution, the model's validation and velocity of the different types of vehicles, reveal that with moving traffic it can precisely replicate heterogeneous traffic flow on highways.

B. Ajitha Thankappan, Yamem Tamut and LelithaVanajakshi (2010)

According to the study the stream models were considered as the basis for traffic flow modelling, design, planning and efficient administration of road networks, stream modelling is crucial. The heterogeneous and less lane-disciplined traffic circumstances seen in India may not be suitable for models created under homogeneous and lane-disciplined traffic conditions. In India, traffic is extremely diverse, with vehicles having a wide range of static and dynamic characteristics sharing the same route without any kind of separation. Vehicles can assume any lateral position depending on available space when there is a lack of lane discipline [7], which increases the complexity.

C. Shree Chetan. R. Patel, Rinkal T. Patel Dr. G. J. Joshi (2015)

In their research paper they showed that knowledge of traffic flow characteristics and how they relate to one another is essential for effective traffic facility design. The speed-density relationship is the most significant relationship.

D. Syed Omar, Ch. Mallikarjuna (2016)

Shows that the input data corresponding to different traffic conditions had a significant impact on the calculated speed density model.
The third essential variable, flow rate or volume, is the simplest to understand conceptually and to measure in the field. It is the number of cars that cross a certain stretch of road in a given amount of time, like an hour. It can be counted manually by standing in one place and counting the number of passing cars, or it can be counted automatically by utilizing loop detectors or other automated vehicle detection technologies.
The stream speed, more specifically the space mean speed, is the second attribute of traffic flow. Other approaches to determining space mean speeds were established because it was challenging to measure the speeds of all the cars that were using a specific stretch of road at the same time. For instance, the harmonic mean of the individual speeds recorded as moving objects pass an observation site during a chosen period of time may be used to determine the space mean speed.
The third factor, density, may be summed up as the number of cars per kilometre of road that are present. Density being an important factor of traffic flow, its uses in freeway traffic management and evaluation has been restricted since it is challenging to quantify from the field. Aerial photography and video-graphic techniques are needed to provide an elevated perspective of the road length needed for a direct assessment of density from the field. Due to this practical challenge, traffic density is typically calculated using other metrics that are simple to assess, such speed, flow, or occupancy. Numerous others have also disputed the idea of density, particularly when it comes to seeing traffic as a continuum.

E. Rajagopal and Tyagi, Darbha (2008)

Considering all of these negative aspects, density is still being reasoned as the major important feature of traffic flow since it's in consensus with the quality of traffic and how easy it is to drive. The discussion regarding various methods regarding density can be divided into two methods i.e., Direct and indirect methods. Input-output counts and photographic technique are examples of direct approaches, but an estimate from other traffic metrics like volume, speed, or occupancy is an example of an indirect method. Using overlapping aerial photos, a photographic approach is used to count the automobiles in an area at various points in time. An introductory add-up of the number of automobiles present in the middle of the two count positions is performed using the second approach, known as the input-output methodology (May 1990). To obtain the density inside the segment, The vehicles entering the section are continuously counted and added, and the sum of automobiles that are leaving the segment is repeatedly reduced. But this procedure is at most functional if the sum total is accurate and dependable.

The density is estimated indirectly from other easily quantifiable variables like volume, speed, or occupancy. The fundamental relation of traffic flow is given as

q=k*u, ……. (1)

Where unit of q is in veh/hr., space mean speed u is in km/h, and k is the density and its units is in veh/km, is used in the approach to determine density from speed-flow measurements. The challenge of determining space mean speed from the field is one issue with this method.

As a result, creating traffic stream models is crucial for the planning, building, and construction of the road network system. In my project, I'll try to create one for the heterogeneous traffic state on the National Highway.

III. TRAFFIC STREAM MODELS

For the purpose of examining various correlations between distinct traffic stream characteristics, models of the traffic stream were built. The Green shield macroscopic model is the most used one. It is characterized by:

A. Macroscopic Stream Model of Green shield's

This model explains how the responses of one traffic flow parameter vary in relation to another. Among these, the relationship between speed and density is the most significant. To create the model, green shield made the assumption that the speed-density relationship was linear, as seen in figure 1.

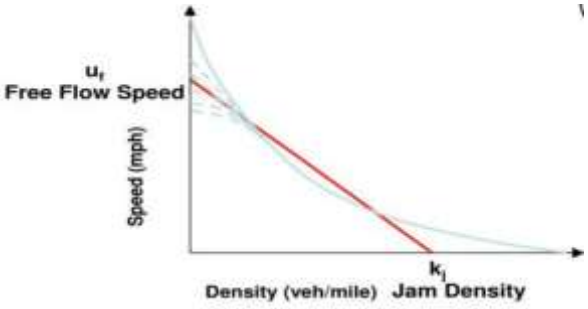

Figure 1: Relation between speed and density

The following equation represents this connection.

$$V = V_f - [V_f/k_j] * k \ldots\ldots\ldots (2)$$

Where k_j is the jam density, V_f is the free speed, and V is the mean speed at density k. The Green shield's model is the name given to the equation. It states that the density becomes zero when the speed approaches free flow speed. The relationship between speed and flow is attained and using this the proportionality between the flow may be derived. Figure 2 depicts the parabolic relationship between flow and density.

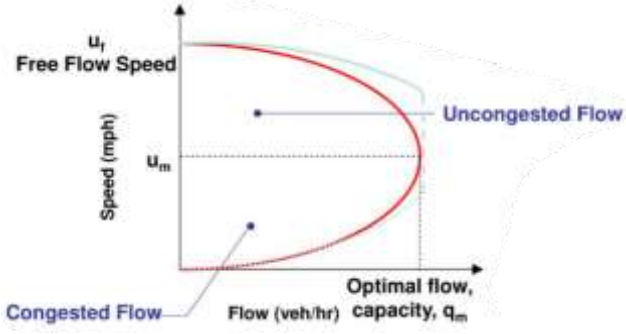

Figure 2: Relationship between Speed and Flow

We know that,

$$q = k.v$$

Substitute equation (2) in equation (1), we get

$$q = k*V_f - [V_f / K_j] *k^2$$

By doing the same we can also find the relation between speed and flow. For this, put k = q/v in and solving, we get

$$q = k_j V - [k_j / V_f] * V^2$$

Figure 2 illustrates this connection, which is once again parabolic. As soon as the relationship between the key elements of traffic flow is established, the boundary conditions can be generated. The boundary conditions to be used are jam density, free flow speed, and maximum flow. In order to find density at maximum flow, differentiate equation $q= k*V_f - [V_f / K_j] *k^2$ with respect to k and equate it to zero, i.e.,

$$d_q / d_k = 0$$

$$V_f – V_f /k_j*2k = 0$$

$$k = k_j /2$$

Denoting the density corresponding to maximum flow as k0,

$$K_0 = k_j /2$$

As a result, the density equivalent to the maximum flow is half that of a jam. Once we have k0, we can calculate q_{max} to find the maximum flow.

$$q_{max} = V_f k_j/2 – [V_f/k_j]. [k_j/2]^2$$

$$=V_f. k_j/2-V_f. k_j/4$$

$$=V_f k_j/4$$

The sum of the open flow and jam density is therefore one-fourth of the maximum flow. The speed at flow velocity, V_0.

$$V_0 =V_f – [V_f/k_j]. kj/2$$

$$V_0 = V_f/2$$

Thus, we get to say that the speed at maximum flow is half of the free speed.

B. Evaluation of Greenfields Model

In particular, free flow speed (V_f) and jam density (k_j) should be obtained if we wish to utilize this model for any traffic stream. It must be gathered by a field survey, which is what is meant by the term "Evaluation procedure." Although it might be challenging to determine the accurate free flow speed and jam density immediately, estimations can be acquired by accumulating a large number of speed and density data and then fitting a linear connection between them. Let y = a + b x be the linear equation, where y represents density k and x represents speed v. The coefficients a and b of linear regression may be solved as,

$$b=n\sum x_i y_i-\sum x_i \sum y_i / n\sum (x_i)^2 – (\sum x_i)^2$$

$$a = \bar{y} + b\bar{x}$$

Alternate method of solving for b is,

$$b = \sum (x_i - \bar{x})(y_i - \bar{y}) / \sum (x_i - \bar{x})$$

Where xi and vi are the samples, n is the number of samples, and $\bar{x}$ and $\bar{y}$ are the mean of xi and vi respectively.

IV. APPROACH OF REGRESSION ANALYSIS

Regression analysis is a type of approach that uses predictive modelling that is called regression analysis. Regression analysis examines the connection between a dependent (goal) and an independent variable (or variables) (predictor). Forecasting, time series modelling and determining the causal link between the variables are all done using this method. Regression is the ideal method

for studying, for instance, the link between reckless driving and the number of accidents a driver causes on the road.
A crucial technique for data modelling and analysis is regression analysis. Here, we attempt to minimize the discrepancies between the data points' varying distances from the curve or line by fitting a curve or line to them. The link between two or more variables is estimated through regression analysis.
Regression analysis has a variety of advantages. These are what they are:
1. It shows the important connections between the dependent and independent variables.
2. It shows the degree to which several independent factors have an influence on a dependent variable.
We may examine the impacts of variables assessed on several scales using regression analysis, such as the impact of price adjustments and the volume of promotions. These advantages assist market researchers, financial analysts, and software engineers in evaluating and selecting the optimal collection of features to include in predictive model construction.

V. METHODOLOGY

A. Flow diagram

The flow chart below outlines my project's methodology and technique.

Start

↓

Site Selection: I have selected a 5km stretch on the national highway connecting Srinagar to Jammu (NH-44).

↓

The stretch that we have selected has to be divided into 50 sections of 100 m each, where 40sections are necessary for the calibration of the relation and 10 sections that we select are required for the validation of the relation.

↓

Data Collection: At the 40 sections selected for calibration. I have to collect the data i.e., traffic speed, traffic flow, Flow Density, Space headway and time headway.

↓

The data that we have recorded at the selected site will be analysed on the computer and then we will determine the values of traffic flow and density.

↓

Using the SPSS relation, I will do the regression analysis of the data attained and will determine the relation between speed, flow density of the traffic and will develop the model.

↓

Continued.

Figure 3: Length of road used for Traffic Survey

B. Survey work

a) Site selection and Traffic Survey for Evaluation of Model

So, for the survey, I kept to the fundamental techniques. Both the traffic travelling from Srinagar to Jammu and the traffic moving from Jammu to Srinagar were surveyed for traffic.
The traffic survey was carried out throughout the day at various intervals. Our poll was conducted from 8:00 a.m. to 6:00 p.m., with the morning peak hour occurring from 8:00 a.m. to 10:30 a.m. and the evening peak hour from 3:30 p.m. to 6:00 p.m.
I demarcated a 50-meter stretch of the road, and I used the stopwatch approach to gauge the speeds of the passing cars. I would start the stopwatch when a car passed the start point, and I would stop it when it reached the finish point. I took note of how long it took the car to travel 50 meters. The same time was recorded for other cars as well. I could determine the speed of the vehicle using the time recorded.

$$V = d / t$$

To measure the flow on the highway, I manually counted the number of vehicles passing through the section during that time. The mixed [6] traffic was divided into various Categories:

- Light commercial vehicle
- Light Motor Vehicle
- Heavy Motor vehicle
- Two-wheeler
- Three-wheeler

Density was measured indirectly from the flow and speeds that had been already measured, using the following equation.

$$q = k.v$$

The procedure was repeated for the next 39 points.

b) Collected data and its Analysis

After collection of data the analysis of the survey data was done and the average speed was calculated using the average time it took to travel 50 meters. The average speed of different kinds of vehicles was also calculated.

The flow was then determined using the survey's data that had been gathered. I multiplied the flow, measured in vehicles per hour, by the respective passenger car unit [4] factors to get the figures in passenger car units per hour. Table 1 lists the passenger car unit factors for several vehicle types.

Table 1: PCU

Serial No.	Vehicle type	PCU
1	Three-Wheeler	0.8
2	Two-Wheeler	0.5
3	Light Commercial Vehicle	1.5
4	Heavy Motor Vehicle	3
5	Light Motor Vehicle	1

Equations were used to derive density from Speed and Flow, and speed of various vehicles were multiplied by PCU values so that the data can be shown in PCU/km. For every site (total being equal to 40), we can determine the speed, flow, and density.

After collecting all the data, the average speed, average flow, average density was calculated including the traffic composition.

The time headway for the average flow was calculated using the given equation

$$h_{ax} = 1/q$$

Similarly, the space headway for the average density was calculated using the given equation.

$$S_{av} = 1/k$$

c) Regression Analysis of the data collected

I used the SPSS program to run a regression analysis of the data after gathering all the information. I discovered the relationship between density and speed. Similar models have been built for the PCU values and for the various vehicle kinds. We can determine the highway's jam density and the cars' free-flow speed using the models that have been created.

d) Validation of the Model for Traffic Survey

I conducted the traffic survey for an additional 10 points after the model had been created in a manner identical to what we had done before. To verify the model, I compared the survey data with the values estimated by the model, calculated the error, and then assessed the model's accuracy.

VI. RESULT AND OBSERVATIONS

A. Traffic Moving from Srinagar to Jammu direction

The following conclusions were drawn from survey for traffic traveling from Srinagar to Jammu-

a) Average Speed of Vehicles

Traffic from Srinagar to Jammu was seen to be flowing at an average pace of 44.874 km/hr. A variety of vehicles, including light motor vehicles, heavy motor vehicles, light commercial vehicles, two- and three-wheelers, were included in the traffic under study. The table 2 that follows lists the average speed of various vehicle types.

$$V_{av} = 44.9 \text{ km/ hr}$$

b) Average Traffic Flow

660 vehicles per hour on average were spotted moving through the gridlock. It was found to be 877.8 in terms of PCU/hr.

$$q_{av} = 660 \text{ veh/hr} = 877.8 \text{ PCU/hr}$$

c) Average Traffic Density

It was discovered that the traffic density was rather low. In terms of PCU/km, the result was 20.385 PCU/km, while the average was determined to be 15.10 veh/km.

$$K_{av} = 13.45 \text{ veh/km} = 20.385 \text{ PCU/km}$$

d) Composition of traffic

Figure 4 below shows the traffic mix of the various types of moving vehicles traveling from Srinagar to Jammu.

Table 2: Average Speed of Different Types of Vehicles in Srinagar- Jammu Direction

Serial No.	Vehicle Type	Average speed (km/hr)
1	Light commercial vehicle	45.6
2	Light Motor Vehicle	57.15
3	Heavy Motor Vehicle	46.15
4	Two-Wheeler	40.32
5	Three-Wheeler	35.15

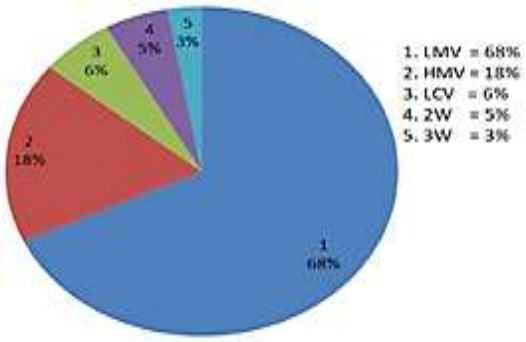

Figure 4: Composition of Vehicles going from Srinagar to Jammu

e) Time-Headway

We calculated the time headway of the cars using the average traffic flow and the information from the data collected during the highway traffic survey. It was determined to be 5.45 sec/veh. This indicates that a car passes a certain location on the roadway every 5.45 seconds.

$$h_{av} = 5.45 \text{ sec/veh}$$

f) Space-Headway

We determined the vehicle space headway using the National Highway NH 44's typical traffic density. It was 66.225 meters per vehicle. It implies that there is a 66.255 m gap between each subsequent car.

S_{av} = 66.225 meter/veh

g) Development of Model

The following model was constructed using all the information gathered from the traffic study on NH 44 for cars traveling from Srinagar to Jammu (after regression analysis was done on data collected).

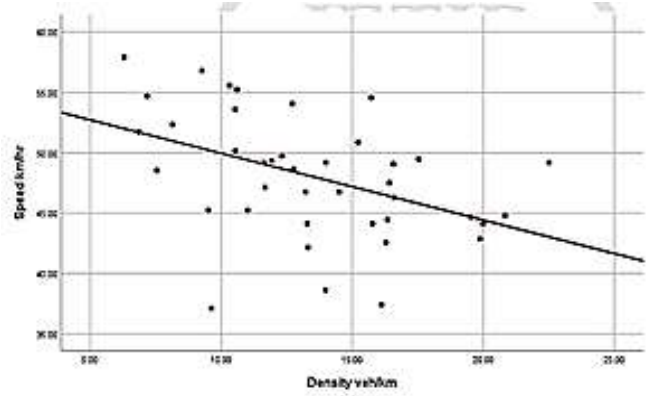

Figure 5: Plot of speed and density of vehicles moving from Srinagar to Jammu direction

The equation for the plot is as follows:

$$v = 55.47 - 0.55k$$

Where v = speed and k = density

The figure 6 shows the flow-density curve and the figure 7 shows the speed-flow curve below:

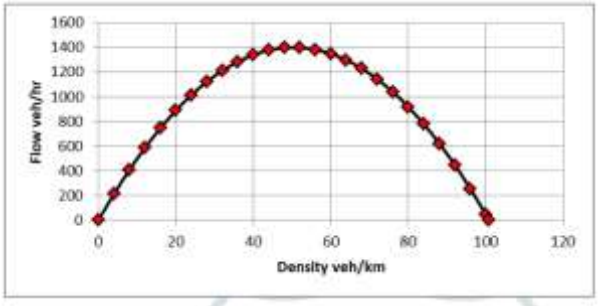

Figure 6: Plot of Flow and Density of vehicles moving from Srinagar to Jammu

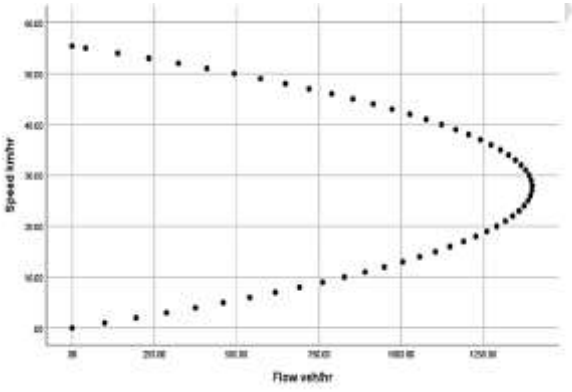

Figure 7: Plot of Speed and Flow of vehicles moving from Srinagar to Jammu

The traffic flow and traffic density relationship are shown by the formula problem

$$q = 55.47k - 0.55k^2$$

Where q = flow(veh/hr) and k = density (veh/km)

The traffic speed and traffic flow relationship are shown by the formula:

$$q = 100.85v - 1.82v^2$$

Since the traffic on the roadway is so diverse, we could create unique models for various vehicle kinds. Light motor vehicles, heavy motor vehicles, light commercial vehicles, two-wheelers, and three-wheelers have each had their own speed-density curves drawn individually. It will aid in our better understanding of the traits of various vehicle kinds.

Below are the models for LMVs and their respective graph is shown in figure 8, and for HMVs its graph is shown in figure 9, for LCVs its graph is shown in figure 10, two- and three-wheelers, along with their associated relations are shown in figure 11 and figure 12

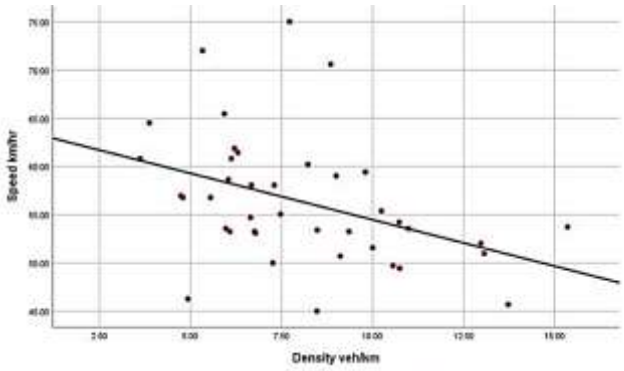

Figure 8: Plot of Model for LMVs moving from Srinagar to Jammu Direction

$$v = 64.1 - 0.96k$$

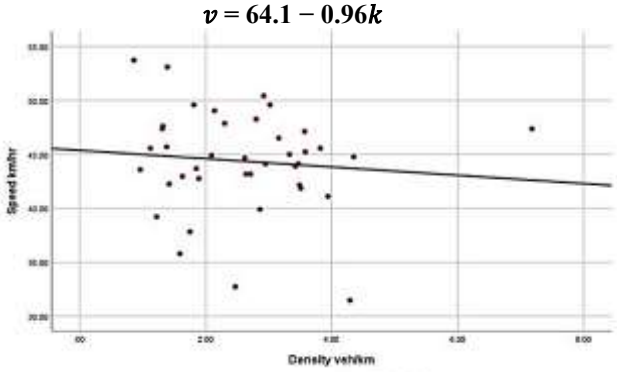

Figure 9: Plot of Model for HMVs moving from Srinagar to Jammu Direction

$$v = 45.37 - 0.38k$$

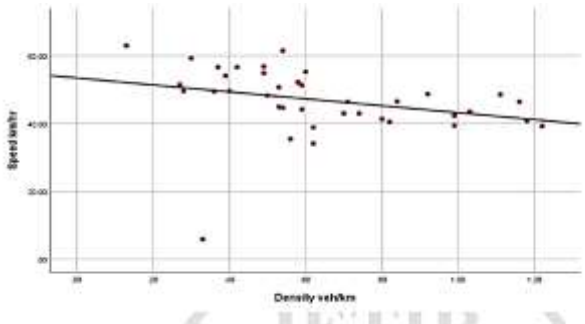

Figure 10: Plot of Model for LCVs moving from Srinagar to Jammu Direction

$$v = 53.4 - 10.23k$$

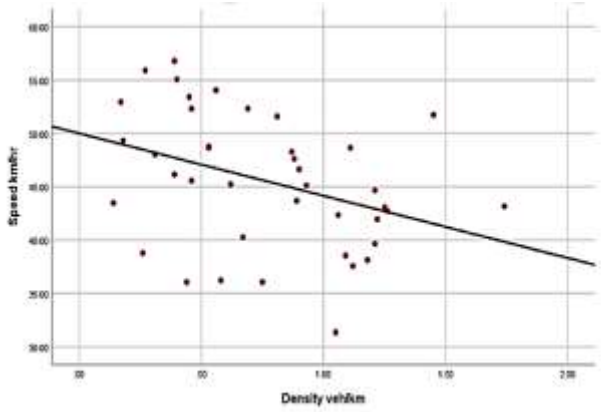

Figure 11: Plot of Model for 2 Wheelers moving from Srinagar to Jammu Direction

$$\mathbf{v = 49.99 - 5.84}k$$

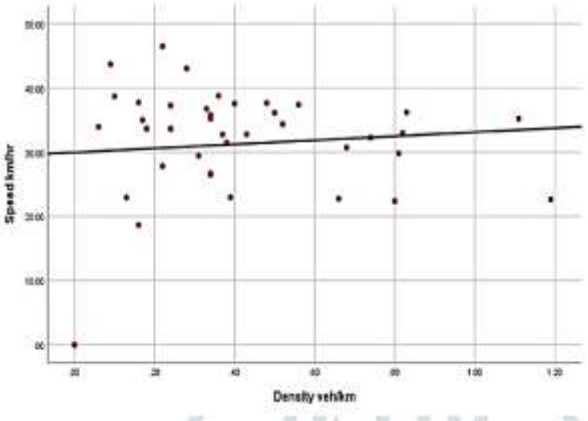

Figure 12: Plot of Model for 3 Wheelers moving from Srinagar to Jammu Direction

$$\mathbf{v = 29.96 + 3.16k}$$

The traffic on the highway being heterogeneous, multiplying the vehicles with their PCU values developed a model for traffic moving in the direction of Srinagar to Jammu in terms of Passenger Car Units and it is given as follows in Figure 13.

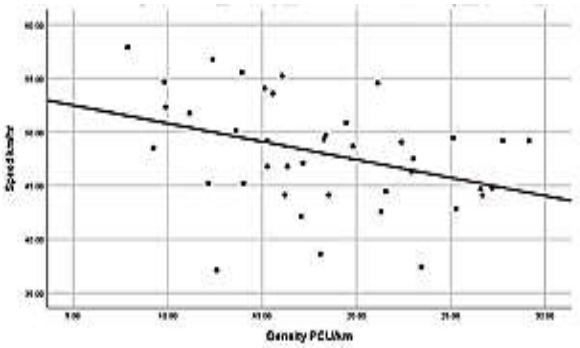

Figure 13: Plot of Speed vs Density graph of vehicles moving in Srinagar to Jammu Direction

The relation obtained from the Figure 13 is

$$\mathbf{v = 54.15 - 0.34}k$$

Where v = speed and k = density. The Flow-Density curve and Speed- Flow curve is represented in Figure 14 and Figure 15 respectively.

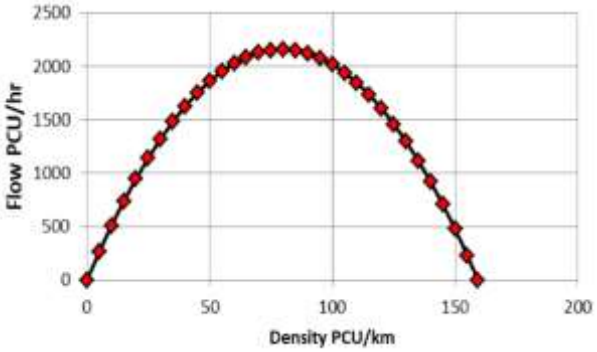

Figure 14: Plot of Flow and Density of vehicles moving from Srinagar to Jammu direction

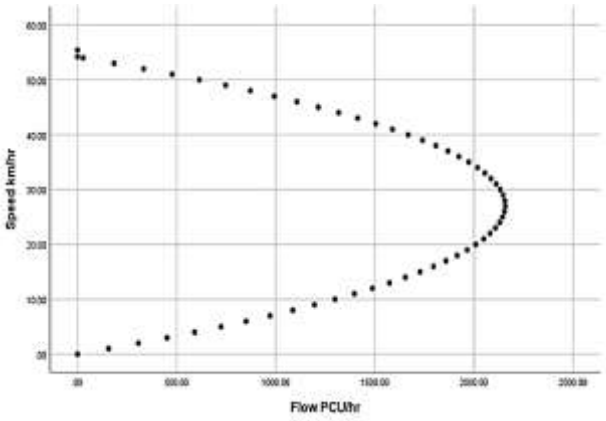

Figure 15: Plot of Speed vs Flow graph of vehicles moving from Srinagar to Jammu Direction

The traffic flow and traffic density relationship are represented as follows:

$$\mathbf{v = 54.16}k - \mathbf{0.34}k^2$$

The traffic speed and traffic flow relationship are represented as follows:

$$q = \mathbf{159.29}v - \mathbf{2.94}v^2$$

h) Developed Model

Another survey was undertaken, and the observed values of traffic density were compared with the traffic density generated from the equation, with the error being noted, for the purpose of validating the model that was built, is shown in Figure 5, and the Table 3 below lists all the observations:

Table 3: Developed Model

Serial No.	Noticed Density of traffic	Vehicle speed (km/hr)	Traffic density using Formula	Percentage error
1	14	50.7	7.4	89%
2	8.56	49.0	13.06	52%
3	5.0	50.95	6.5	30%
4	11.0	50	9.7	13%
5	17.1	47.65	17.56	2%
6	12.86	48.96	13.2	2.6%
7	10.0	49.89	10.01	1%
8	20.0	46.55	21.23	6.15%
9	14.55	49.01	13.03	11%
10	10.5	50	9.733	7.8%

Using the model, we can say that the model is 78.545% correct as shown by Table 3 that the average error between the measured observed values of density and the values of density computed from equation k = 55.47-v /0.55 is 21.455%. Consequently, the created model is verified.

i) Free Flow Speed

Using the developed model, the free flow speed of vehicles on highway moving in the direction of Srinagar to Jammu was found as follows:
Free flow speed = V_f= 55.47 km/hr

j) Jam Density

For the traffic moving in Srinagar to Jammu direction We calculated the jam density of the National Highway from the model was found to be equal to
Jam density = K_{jam} = 100.85 veh /hr = 159.29 PCU / km

k) Maximum Flow

The traffic moving in the direction of Srinagar and Jammu We can determine the maximum traffic flow on National Highway once more using the generated model and was found as,
Maximum flow = q_{max} = 1398.54 veh/km = 2156.79 PCU/hr
Complimentary to this maximum flow the density and speed at maximum flow can also be found and is equal to
Density at maximum flow = k_0= 50.43 veh /km = 79.65 PCU/ km
Speed at maximum flow = V_0 = 27.73 km/hr

VII. CONCLUSION

In this paper it has been shown that the capacity of the road doesn't only depend on the road width but other factors like traffic volume, speed, density, jam density peak hour flow, free flow speed etc also plays a vital role and thus during the design of road all these factors should be considered. Light commercial vehicles and light motor vehicles including two wheelers (seepage action) and three wheelers move at a very fast speed but the average speed of the whole traffic is low due to the heavy motor vehicles. The macro parameters and its association with traffic streams had been tried in this study and statistical data that I collected; we can assume that the speed of vehicles moving on national highways are having average speed of about 44.874 km/hr which is little more than the speed of vehicles moving on the urban road. I can conclude from the developed model that the jam density of the highway is quite higher than the highest density observed during the traffic survey conducted on the highway. Identically, the maximum number of vehicles that can flow on the National Highway is extremely high with approximately 2000 veh/hr, on the other hand from the survey that we conducted, the maximum flow that was observed did not even cross the 1000 veh/hr mark. Assessment of Speed-density models essentially rely on the method by which the Survey data is gathered or forecasted using the variables generated. The pattern of traffic flow stream and its interrelationship among the various variables is a prerequisite for designing, Planning, maintenance and the quality of service that is being provided to the users of the highway and for the evaluation of traffic facilities. The purpose of this study is to analyse the traffic flow stream pattern of national highways particularly NH-44. This National highway connects Srinagar to Banihal and is used as a basis for the study. Traffic stream data for a single road stretch is collected using the technique of video image processing method and spot speed method. Under heterogeneous traffic movement the pattern of Flow density, speed of vehicles generated in the study can be used to describe the functioning of traffic streams accurately. The nature of the speed-density model is linear although flow-density and speed-flow models are specified using the second order polynomial quadratic relationship. The model obtained can be used to evaluate the nature of other traffic flows on similar roads having the same characteristics like road width, speed, volume and similar traffic composition. These models can also be used by highway designers for establishing the level of service for transport facilities so that transport planners and engineers can use them as a mechanism for the design, planning of the highway.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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