SPOT SPEED SURVEY AND ANALYSIS ON THE VARIOUS CATEGORIES OF ROAD IN AND AROUND JALANDHAR

Submitted in partial fulfillment of the requirements

of the degree of

MASTER OF TECHNOLOGY

in

CIVIL ENGINEERING

by

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2016

CERTIFICATE

Certified that this project report entitled **"SPOT SPEED SURVEY AND ANALYSIS ON THE VARIOUS CATEGORIES OF ROAD IN AND AROUND JALANDHAR "** submitted by "**JYOTI AIND**"(Reg. No. 11511839) students of Civil Engineering Department, Lovely Professional University, Phagwara, Punjab who carried out the project work under my supervision. This report has not been submitted to any other university or institution for the award of any degree.

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ACKNOWLEDGEMENT

For the completion of this project I would like to acknowledge my respected teacher "Mr. Akash Verma " who was always worthily helpful to help me in my queries in different aspects.

I would also like acknowledge my friends who helped me a lot in the completion of this and were always there at me call.

Signature of Student

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ABSTRACT

The Vehicle Spot Speed Study is expected to measure the speed characteristics at predetermined area under the activity and natural conditions winning at the period of the study. Spot speed data are used as a part of various development building works out, for instance, choosing action signal planning, roadway restrain, evaluating the practicality of overhauls, and presenting speed zones. The range, time and conditions of the study may be coordinated by its objective and expansion. In case approach paces to a merging are required, the estimations should be taken upstream of the intersection point going before vehicle deceleration for a possible stop at the intersection point. If the study requires free-stream speeds, the estimations should be taken in the midst of off-zenith times. A comparable method of reasoning should be taken after for estimations required in the midst of night conditions, wet black-top, so forth. There are two ordinarily utilized ways to deal with gather vehicle speeds at spot areas: singular vehicle choice strategy and all-inspecting vehicle technique:. The individual vehicle assurance system includes using a manual speed estimation method and is generally used for transient speed estimations. The all-looking at methodology uses automated as a piece of road or roadside estimation equipment (e.g., pneumatic tubes, standard acknowledgment circles, point circles, et cetera.) And is fitting to use for structure execution checking system. This segment focuses on the individual vehicle assurance methodology. Spot speed studies are key for measuring particular variables and figures required the outline and examination of the thoroughfare system. Watched paces are used for utmost examination, geometric layout, prosperity measures, speed examples and evaluation. Speed considers help in the essential authority frames and in beforehand, then sometime later reviews to assess the practicality of roadway changes. Moreover, speed recognitions make sense of if the roadway needs new law approval, realignment, or revamping. Spot speed data have different prosperity applications, including the going with: choosing existing development operations and evaluation of action control devices, setting up roadway arrange segments, and measuring ampleness of action control devices or development programs, including signs and markings, action operational changes, and speed usage programs [Robertson 3]. Because of the Significance of such speed focuses on, data must be assembled authentically and showed effectively.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1
INTRODUCTION

1 OVERVIEW

"Direction is the most exceptional weapon which you can use to change the world." – **Nelson Mandela**

Speed is essential measures to assess security of the street organize. Speed is likewise a critical transportation parameter in light of the fact that other than wellbeing, it identifies with time, solace, comfort, and financial aspects. As indicated by Currin (2001), rapid conveys high hazard, while low speed is moderately protected. The plan speed ought to be made relying upon the sheltered speed point of confinement of the street. Speed is one of the activity operational components that ought to be considered in the outline of the street geometrics.

KEYWORDS: Speed, Modal Speed Outline Component, Spot Speed, 85th Percentile Speed.

1.1 AREA

The study region is an extend of NH1 and VR street in Chaheru and Ludhiana .Chaheru is a town in the locale of Kapurthala, Punjab, India. Closest urban regions are Phagwara and Jalandhar. According to the 2011 measurements, by the Indian Government, Chaheru has 509 families, and a people of 2,458; 1248 guys.

Ludhiana is a city and a metropolitan enterprise in Ludhiana area in the Indian condition of Punjab, and is the biggest city north of Delhi. It is the biggest city in the state, with an expected populace of 1,693,653 as of the 2011 Evaluation. The populace increments significantly amid the collecting season because of the relocation of workers from the eastern conditions of Uttar Pradesh, Bihar, Odisha and Delhi. Ludhiana is found 98 kilometers (61 mi) west of the state capital Chandigarh on NH 95 and is halfway situated on National Expressway 1, which keeps running from the Indian capital New 51%), and 1210 females (49%)

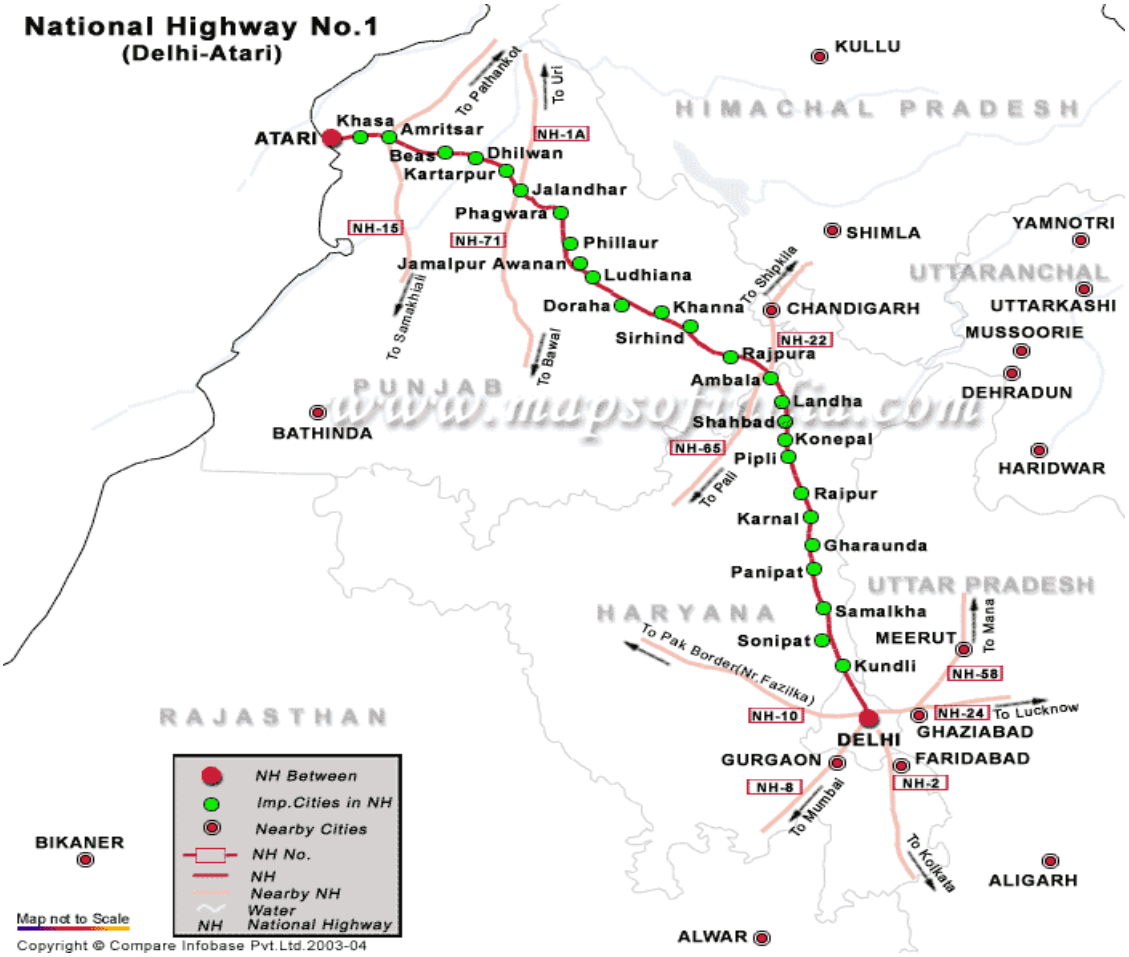


Figure 1.1 NH-1 source: Google

Delhi to Amritsar Ludhiana is associated with different urban communities of Punjab furthermore with different states by Transport benefit. A few noteworthy National Roadways, NH1, NH95, NH11, NH20 go through the city. The transportation administrations are given by state possessed Punjab Roadways and private transport administrators.

2 SCOPE OF SPOT SPEED STUDY

Spot speed studies are coordinated to assess the movement of rates of vehicles in a surge of activity at a particular region on a roadway. The proposed look into work goes for breaking down the modular speed of vehicles, highway outline component ,upper and lower speed restrain for regulation, planning and analysis , traffic operation –control and direction.

1.2.1 OBJECTINE

- Figure out if complaints about speeding are valid
- Assess the impacts of physical enhancements
- Build up passing and no-passing zones
- Analyze accident data
- Plan geometric alignment
- Build up speed zone and so on., and so on

1.3 DATA ACCUMULATION AND METHODOLOGY

- ✓ The data is regularly in view of arbitrarily inspecting singular vehicle speed over short time period.
- ✓ It depends on upon watching the time required by vehicle to cover a short separation of Roadway.
- ✓ Mid Block of the road and straight and level sections of highways
- ✓ Not near crossing point.
- ✓ Off--peak period sunshine hours on a typical weekday.
- ✓ Avoid external influences such as traffic lights, busy access roads;

1.3.1 REQUIREMENTS:

- ✓ Stop watch.
- ✓ Measuring tape
- ✓ Note book
- ✓ Pen

CHAPTER 2

LITERATURE SURVEY

2 OVERREVIEWS

Studied on speed has been finished by numerous reasearcher.They gave the numerous thoughts regarding Speed. Speed is a critical parameter for activity build.

Ashley (1994) and Khanna (2001) expressed that the required geometric plan of roadway relies on upon the paces that vehicles are voyaging in this manner, amid the outline arrange, suitable speed along the parkways might be resolved ahead of time.

Hong and Oguchi (2005) gave a complexity see expressing that speed of voyaging vehicles is reliant upon the geometric outline of the roadways. .

Regarding the appropriate time to direct the spot speed study, Mohamed (1993) has proposed the time between 9.00 a.m. To 12.00 twelve; 3.00 p.m. To 6.00 p.m.; and 8.00 p.m. To 10.00 pm.

As per Khanna (2001), spot velocities are influenced by physical components of the street for instance asphalt width, curve, sight separate, angle, asphalt unevenness crossing points, and roadside advancements. Different elements that could impact spot velocities are ecological conditions (like climate, perceivability), requirement, movement conditions, driver, vehicle, and rationale of travel.

Krishna Prasad Shrestha (2010) concentrated on the speed zones in provincial parkway a place situated at Nepal in Nevada State. He watched that around 63% street mishaps were happened at ordinary condition. 87%, 70%,60% street mischances were seen in dry condition, in clear climate condition, light condition separately.

In May 2014, At Anand City Dipak K. Thakor, Dr. L B Zala ,Prof. A. A. Amin watched that the mean speed of general movement stream was 25 kmph which was less. This demonstrated the diminishment in level of administration. Likewise, fifteenth percentile speed was 19 kmph which showed the vehicle beneath this speed (I.E. Cycles) discourage the running activity. which demonstrated the information was extremely poor.

Solomon (1) discovered high consistence rates in his 1964 investigation of thruways in the U.S. note that today's vehicles and drivers have diverse attributes from those in 1964. Solomon's study considered 2-path expressways and 4-path partitioned thruways, just a single of which had full get to control like an interstate. Therefore, the consistence rates found by Solomon don't coordinate those found in this study.

Utilizing various free factors. Walk 2011 Dharamveer Singh, Musharraf Zaman, gave ann models. Which implies fake neural system (ann) - based models to evaluate V85.

In 2003 Fitzpatrick Et Al., gave the thought were that speed is utilized as an execution measure to assess thruway and road plans. Agent el al.,(1998) gave the ideas that traffic speed is an important parameter because it relates to safety,time,comfort,convenience and economics.

Donald,(1994) gave thought that the drivers' prior knowledge of the road may encourage them to drive faster than the posted speed limit.

Garber,(2002) proposed that driver error can occur in many ways.These include attention to the roadway and surrounding,traffic,failure to yield the right of way, and traffic law. A major contributing cause of many crashes situations is the performance of the driver of one or both of the vehicle involved.

Pursula and Enberg,(1991) found that an increase in two-lane flow rate from 400 to 1600 vehicles hours decreased the traffic speed from 43.5mph to 37.3mph and increased the queue length significantly.

Fitzpatrick et al.,(2003) gave the proposed that speed is used as a performance measure to evaluate street designs and highway.

Donald,(1994) observed that speed limit is used in most countries to regulate vehicle speed .Most traffic Engineers believe that speed limits should be posted to reflect the maximum speed considered to be safe and reasonable by a majority of drivers using the roadway under favourable conditions.

Taylor et al.,(2007);Mc Fadden et al.,(2001);Najjar et al.,(2000) Agent et al.,(1998) conducted the procedures to set speed limits have evolved through years of experience and research. That means most states and localities set speed limits for

streets and highways based on the results of Engineering and traffic investigations. For Example, Garber,(2002) conducted the spot speed study to estimate the distribution of vehicle speeds in a stream of traffic at a particular location of highway.

Agent et al.,(1998) Homburger et al.,(1996) found that 85^{th} percentile of speed(V85) is normally assumed to be the highest safe speed for a roadways

Lamm et al.,(1990) found no statistical differences in operating speed on dry and wet pavement.

Farouki and Nixon found that free-flow speeds on roads varying from 17 to 46ft wide. They was observed that mean speed increases linearly with lane width.

Similar observations were also found by Gattis et al.,(1999) and Heimbach et al.,(1998) were repeated.

Hall and Ibrahim (1994); gave the ideas that is light rain affected speed by 1mph and heavy rain had an effect of 3 to 6 mph.That means wet and dry condition of the pavement also affects the traffic speed.

Polus et al.,(1991) Mckelvey et al.,(1998) gave the ideas regarding vehicles travel behaviour varies with drivers and male tend to drive faster than older and female drivers for the same roadway condition.

CHAPTER 3
DESCRIPTIVE STATISTICS OF SPEED DATA

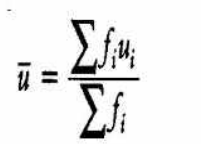
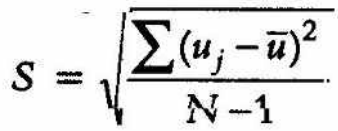
Once data are collected, the primary thing I do is to process a few elucidating measurements to get a few thoughts regarding the appropriation of the speed information. (Take note of that numerous measurable investigations utilized as a part of activity building accept information are regularly appropriated. ➔ In this way, the objective is to check whether they are truly regularly appropriate.

3.1 TYPICAL DESCRIPTIVE STATISTICS ARE:

- Average speed
- Variance and standard deviation
- Median speed
- Modal speed (or Modal speed range ➔ Needs a histogram)
- The i^{th}-percentile spot speed

3.2 ANALYSIS OF SPOT SPEED DATA

- Steps to prepare frequency distribution curve Table:
- Select number of classes typically between 8 – 20 (another framework: choose stretch out for a class size of 8, then choose keep running for a class size of 20, by detaching the refinement among max and min speeds by 8 then by 20, then selecting a range between these greatest and min ranges).
- The mid value for each class is used as a speed value for that class frequency distribution curve (speed mid qualities versus frequency distribution curve).
- Cumulative distribution (maximum breaking points of speed classes versus frequency distribution curve)

Average speed	Speed data Grouped 	Not Grouped $u = \Sigma u_j/N$
Standard deviation	$S = \frac{\sqrt{\sum f(ui-u)}}{\sqrt{N-1}}$	
Variance	S^2	

3.3 COMMON TERMS

MODAL SPEED:

Modal speed is the most preferred speed at which maximum proportion of vehicles travel which can be obtained by plotting the frequency distribution curve.

AVERAGE SPEED:

The arithmetic mean is taken as the average speed.

SPACE MEAN SPEED:

The mean speed over a space at a given instant is called the space mean speed.

TIME MEAN SPEED:

The mean speed of vehicles over a period of time at a point in space is called the time mean speed.

98TH PERCENTILE SPEED:

It is the speed below which 98 % of all the vehicle travel, is used as a design speed in geometric design. Sometime 95th percentile speed is also used for this purpose.

85TH PERCENTILE SPEED:

IT is the speed below which 85th % of all vehicle travel, is used for determining the speed limits for Traffic regulation.

50th PERCENTILE SPEED OR THE MEDIAN SPEED:

It is the speed at which there are as many vehicles going faster as there are going slower.

15th PERCENTILE SPEED:

It is the speed below which is 15% of all the vehicles travel, is used to determine the lower limit on major highway facilities such as Expressways.

CHAPTER 4

DATA OF SPOT SPEED

Table 4.1 spot speed data of buses→

LOCATION: CHAHERU	**DATE: 2/10/16**
WEATHER: SUNNY DAY	**TIME: 10 A.M. TO 2P.M.**
TYPE OF ROAD : NH1	**BASE LENGTH: 50m**
MEASUREMENT TECHNIQUE: MANUALLY	**VEHICLE: BUSES(50)**

S.N.	Dist.(m)	Time(s)	Speed(m/s)	Speed(km/h)
1	50	2.73	18.32	65.93
2	50	2.75	18.18	65.45
3	50	2.33	21.46	77.25
4	50	2.47	20.24	72.87
5	50	2.83	17.67	63.60
6	50	3.09	16.18	58.25
7	50	2.77	18.05	64.98
8	50	2.75	18.18	65.45
9	50	2.39	20.92	75.31
10	50	2.46	19.23	69.23
11	50	2.39	20.92	75.31
12	50	2.34	21.36	76.92
13	50	2.02	24.75	89.10
14	50	2.82	17.73	63.80
15	50	2.65	18.87	97.92
16	50	2.18	22.94	82.57
17	50	2.74	18.25	65.70
18	50	2.36	21.19	76.27
19	50	2.83	17.68	63.60
20	50	2.50	20.00	72.00
21	50	2.22	22.52	81.08
22	50	2.26	22.12	79.65

S.N.	**Dist.(m)**	**Time(s)**	**Speed(m/s)**	**Speed(km/h)**
23	**50**	**2.73**	**18.32**	**65.93**
24	**50**	**2.25**	**22.22**	**80.00**
25	**50**	**2.33**	**21.46**	**77.25**
26	**50**	**2.36**	**21.18**	**76.27**
27	**50**	**2.54**	**19.69**	**70.86**
28	**50**	**2.55**	**19.61**	**70.59**
29	**50**	**2.67**	**18.73**	**67.42**
30	**50**	**2.68**	**18.66**	**67.16**
31	**50**	**2.50**	**20.00**	**72.00**
32	**50**	**2.15**	**23.26**	**83.72**
33	**50**	**2.01**	**24.88**	**89.55**
34	**50**	**2.60**	**19.23**	**69.23**
35	**50**	**3.08**	**16.23**	**58.44**
36	**50**	**2.80**	**17.86**	**64.29**
37	**50**	**2.72**	**18.38**	**66.18**
38	**50**	**2.42**	**20.66**	**74.38**
39	**50**	**2.45**	**20.41**	**73.47**
40	**50**	**2.61**	**19.16**	**68.97**
41	**50**	**2.09**	**23.92**	**86.12**
42	**50**	**2.19**	**22.83**	**82.19**
43	**50**	**2.71**	**18.45**	**66.42**
44	**50**	**2.27**	**22.03**	**79.30**
45	**50**	**2.58**	**19.38**	**69.77**
46	**50**	**2.77**	**18.05**	**64.98**
47	**50**	**2.96**	**16.89**	**60.81**
48	**50**	**2.55**	**19.60**	**70.59**
49	**50**	**3.05**	**16.39**	**59.02**
50	**50**	**2.99**	**16.72**	**60.20**

TABLE :4.2

SPEED RANGE Kmph	MID SPEED (x)	FREQUENCY (f)	%FREQUENCY (%f)	%CUMMULATIVE FREQUENCY (%c.f)	(fx)
40-50	45	0	0	0	0
50-60	55	3	6	6	165
60-70	65	21	42	48	1365
70-80	75	17	34	82	1275
80-90	85	8	16	98	680
90-100	95	1	2	100	95
100-110	105	0	0	100	0
		$\sum f=50$			$\sum fx =3580$

- **AVERAGE SPEED FOR BUSES = $\sum f.x / \sum f$ = (3580/50) = 71.6 kmph**

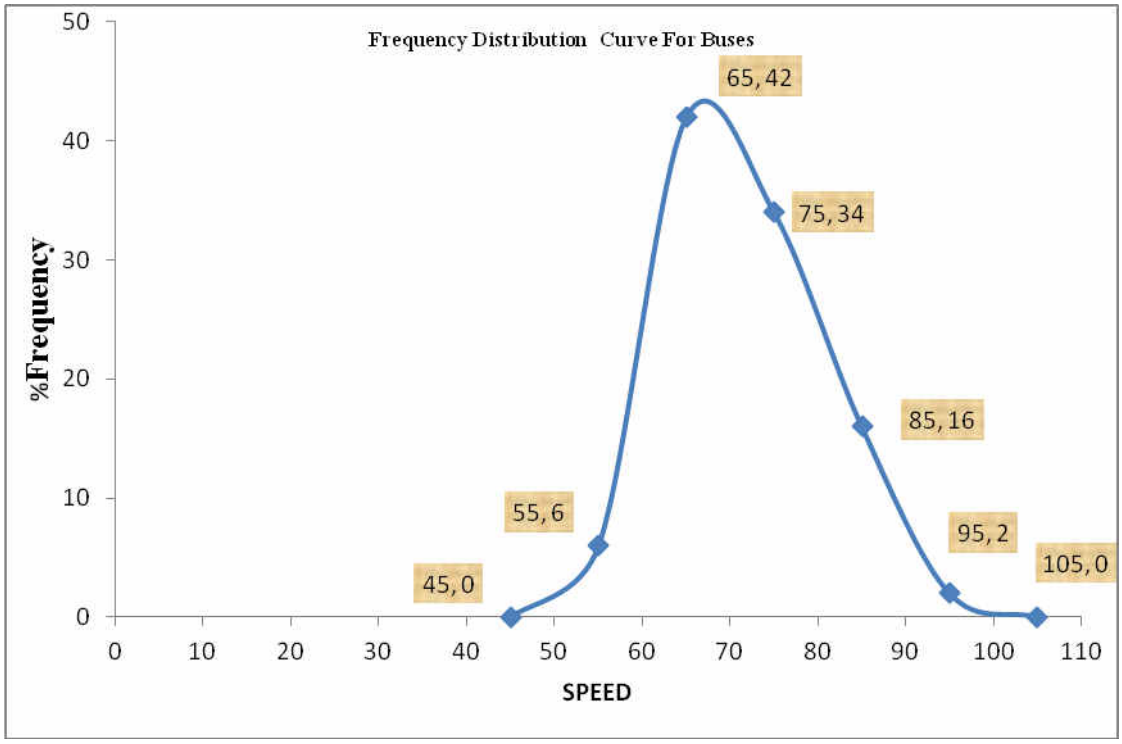


Figure :4.1

- From frequency Distribution curve Modal speed =**65kmph**
- Therefore the most preferred speed at which maximum Proportion of buses travel is the **MODAL SPEED** = **65** KMPH

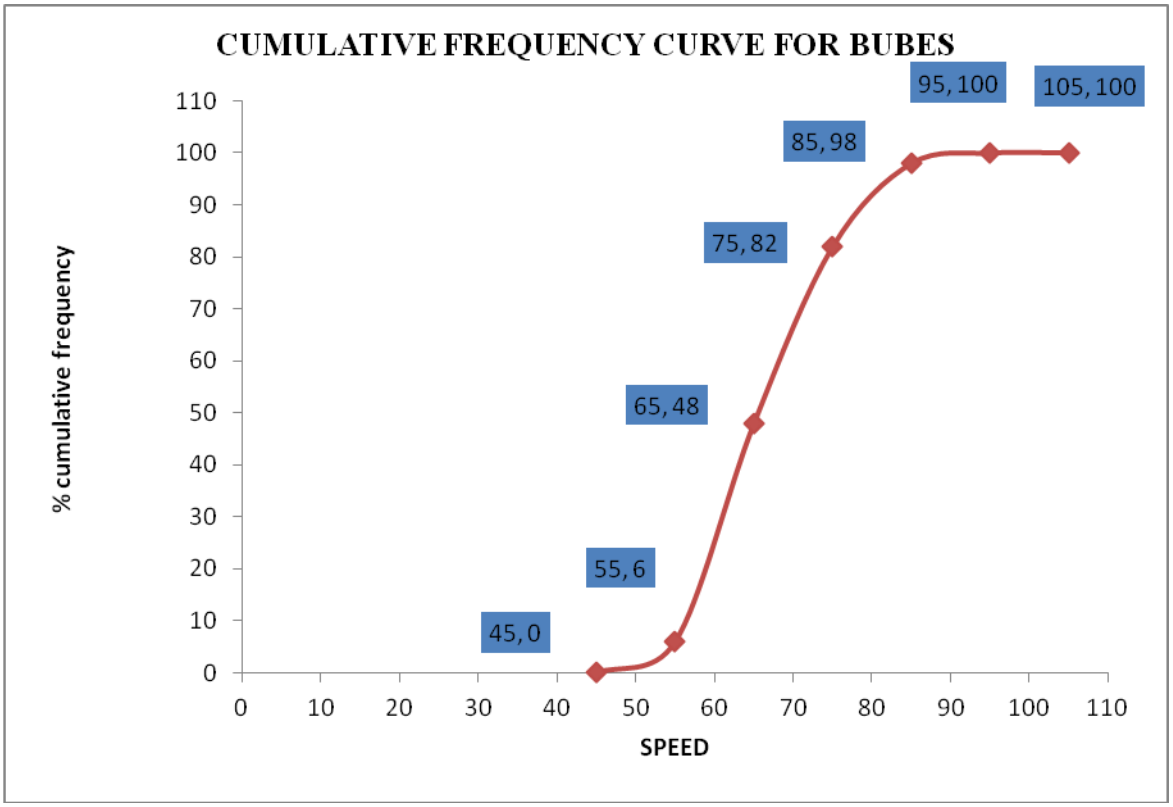


Figure : 4.2 cumulative distribution curve for buses

- **FOR NH1 CHAHERU FOR BUSES**

1. UPPED SPEED = 85^{th} percentile speed

= 80 kmph

2. LOWER SPEED = 15^{th}percentilespeed

= 60 kmph

3. DESIGN SPEED = 98^{th}percentile speed

= 85 kmph

4 . MEDIAN SPEED = 50^{th} percentile speed

= 70 kmph

Table : 4.3

SPEED RANGE Kmph	MID SPEED (v)	(q)	(q.v.)	(q/v)
40-50	45	0	0	0
50-60	55	3	165	0.0545
60-70	65	21	1365	0.3230
70-80	75	17	1275	0.2266
80-90	85	8	680	0.0941
90-100	95	1	95	0.0105
100-110	105	0	0	0.0
		$\sum f=50$	$\sum qv = 3580$	$\sum q/v = 0.7087$

Space mean speed (Vs) = $\sum (q/v)/(\sum f)$

= (0.7087) /(50)

= 0.01417 kmph

Time mean speed (Vt) = $\sum qv/\sum f$

= (3580)/ 50

= 71.6 kmph

Standard deviation (S^2) = Vs .(Vt -Vs)

= 0.01417(71.6 - 0.01417)

= 1.014

Table: 4.2 spot speed data of cars→

LOCATION: CHAHERU	**DATE: 2/10/16**
WEATHER: SUNNY DAY	**TIME: 10 A.M. TO 2P.M.**
TYPE OF ROAD : NH1	**BASE LENGTH: 50m**
MEASUREMENT TECHNIQUE: MANUALLY	**VEHICLE: cars(50)**

S.N.	Dist(m)	Time (s)	Speed(m/s)	Speed(Km/h)
1	50	2.52	19.81	71.32
2	50	3.26	15.34	55.21
3	50	3.71	13.48	48.52
4	50	1.94	25.77	92.78
5	50	3.05	16.93	59.02
6	50	3.95	12.66	45.57
7	50	2.77	18.05	64.98
8	50	2.28	21.93	78.95
9	50	3.46	14.45	52.02
10	50	2.65	18.87	67.92
11	50	2.40	20.83	75.00
12	50	2.73	18.32	65.93
13	50	2.56	19.53	70.31
14	50	3.35	14.93	53.73
15	50	2.50	20.00	72.00
16	50	2.29	21.83	78.60
17	50	2.37	21.10	75.95
18	50	2.17	23.04	82.95
19	50	1.98	25.25	90.90
20	50	2.22	22.52	81.08
21	50	1.85	27.03	97.30
22	50	2.33	21.46	77.25
24	50	3.30	15.15	54.55
25	50	2.60	19.23	69.23
23	50	2.91	17.18	61.86

S.N.	Dist.(m)	Time(s)	Speed(m/s)	Speed(Km/h)
23	50	2.91	17.18	61.86
24	50	3.30	15.15	54.55
25	50	2.60	19.23	69.23
26	50	2.29	21.83	78.60
27	50	3.12	16.03	57.71
28	50	2.72	18.38	66.18
29	50	2.00	25.00	90.00
30	50	3.12	16.03	57.69
31	50	2.12	23.58	84.91
32	50	1.85	27.03	97.30
33	50	1.94	25.77	92.78
34	50	2.17	23.04	82.95
35	50	1.82	27.47	98.90
36	50	2.08	24.04	86.54
37	50	1.70	29.41	105.88
38	50	2.28	21.93	78.95
39	50	3.16	15.82	56.92
40	50	1.51	33.11	119.20
41	50	3.44	14.53	52.33
42	50	2.37	21.10	75.95
43	50	1.57	31.85	114.65
44	50	2.32	21.55	77.59
45	50	2.52	19.84	71.43
46	50	2.88	17.36	62.50
47	50	2.05	24.39	87.80
48	50	2.59	19.31	69.50
49	50	1.66	30.12	108.43
50	50	2.24	22.32	80.36

TABLE :4.5

SPEED RANGE Kmph	MID SPEED (x)	FREQUENCY (f)	%FREQUENCY (%f)	%CUMMULATIVE FREQUENCY (%c .f)	(fx)
30-40	35	0	0	0	0
40-50	45	2	4	4	90
50-60	55	6	12	16	330
60-70	65	11	22	38	715
70-80	75	13	26	64	975
80-90	85	11	22	86	935
90-100	95	3	6	92	285
100-110	105	2	4	96	210
110-120	115	2	4	100	230
		∑f=50			∑fx =3770

- **AVERAGE SPEED FOR CARS = ∑ f.x / ∑f = (3770/50) = 75.4 kmph**

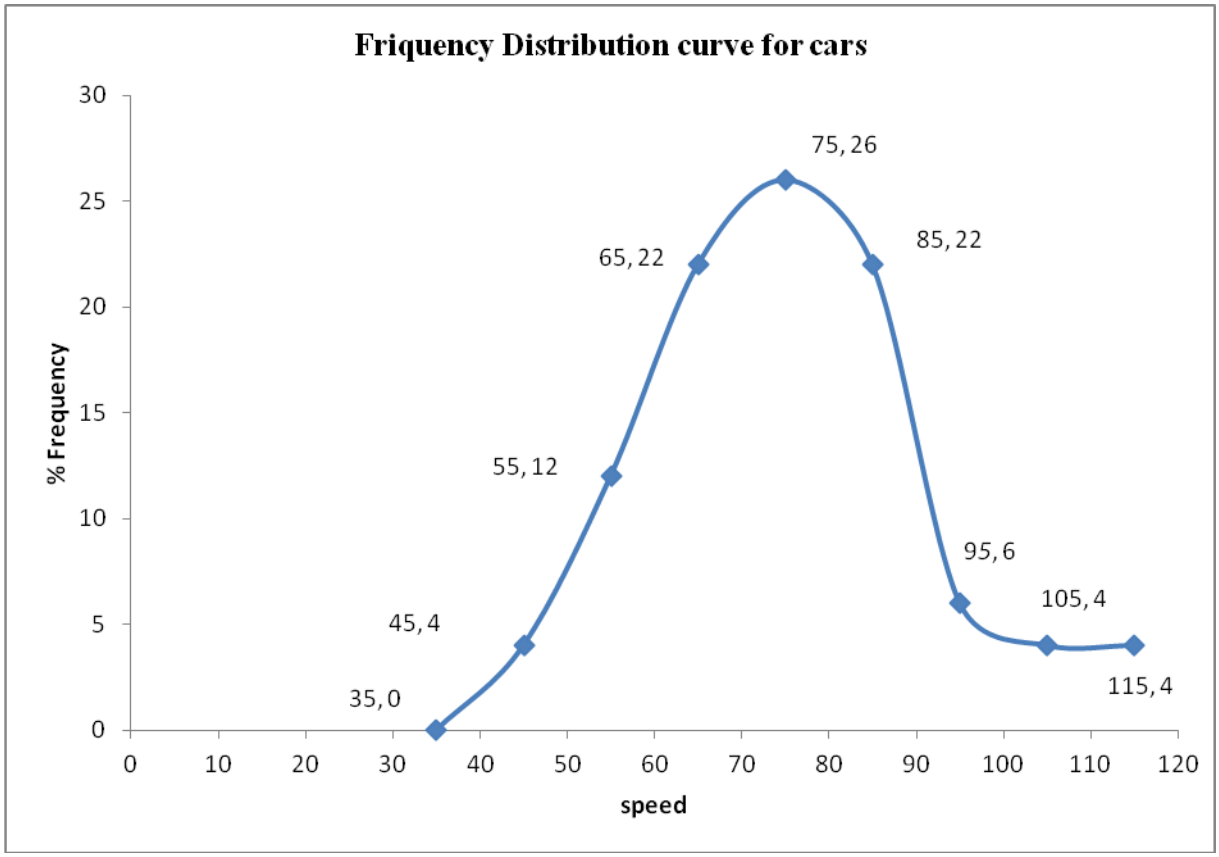


Figure :4.3 frequency Distribution curve for cars for NH1

- From frequency Distribution curve Modal speed =**75 kmph**
- Therefore the most preferred speed at which maximum Proportion of cars travel is

the **MODAL SPEED** = **75** KMPH

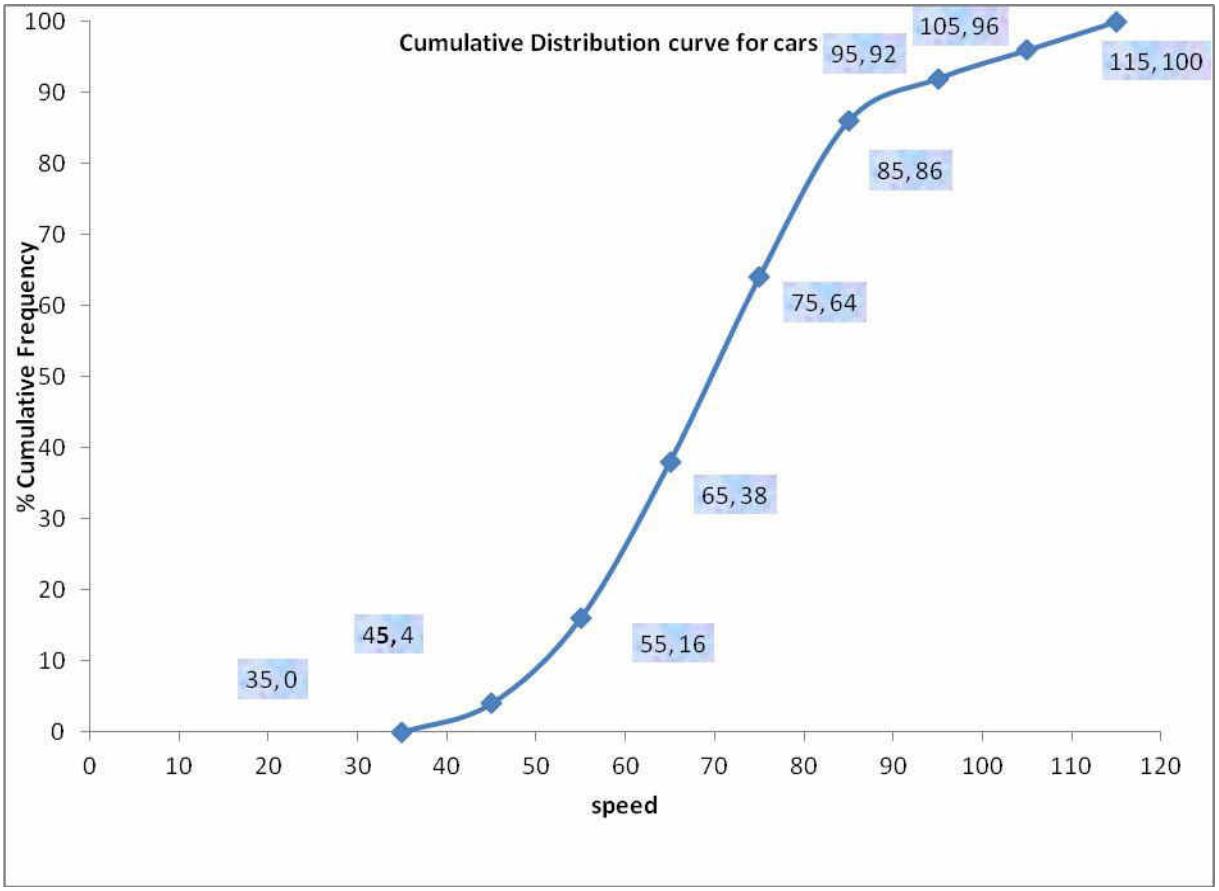


Figure : 4.4 cumulative distribution curve for cars

- **FOR NH1 CHAHERU FOR BUSES**

1. UPPED SPEED = 85^{th} percentile speed

   = 80 kmph

1. LOWER SPEED = 15^{th}percentilespeed

   = 60 kmph

3. DESIGN SPEED = 98^{th}percentile speed

   = 85 kmph

4 . MEDIAN SPEED = 50^{th} percentile speed

   = 70 kmph

Table :4.6

SPEED RANGE Kmph	MID SPEED (v)	(q)	(q.v.)	(q/v)
30-40	35	0	0	0
40-50	45	2	90	0.0444
50-60	55	6	330	0.1090
60-70	65	11	715	0.1692
70-80	75	13	975	0.1733
80-90	85	11	935	0.1294
90-100	95	3	285	0.0315
100-110	105	2	210	0.0190
110-120	115	2	230	0.0173
		∑f=50	∑qv =3770	∑ q/v = 0.6931

Space mean speed (Vs) = ∑ (q/v)/(∑f)

= (0.6931) /(50)

= 0.0138 kmph

Time mean speed (Vt) = ∑qv/∑f

= (3370)/ 50

= 75.4 kmph

Standard deviation (S^2) = **Vs .(Vt -Vs)**

= 0.0138 (75.4 - 0.0138

= 1.04

Table: 4.3 spot speed data of trucks→

LOCATION: CHAHERU			**DATE: 2/10/16**	
WEATHER: SUNNY DAY			**TIME: 10 A.M. TO 2P.M.**	
TYPE OF ROAD : NH1			**BASE LENGTH: 50m**	
MEASUREMENT TECHNIQUE: MANUALLY			**VEHICLE: Trucks(50)**	
S.N.	**Dist.(m)**	**Time(s)**	**Speed(m/s)**	**Speed(km/s)**
1	**50**	**4.46**	**11.21**	**40.35**
2	**50**	**3.86**	**12.95**	**46.63**
3	**50**	**4.46**	**11.21**	**40.35**
4	**50**	**4.54**	**11.01**	**39.64**
5	**50**	**3.23**	**15.47**	**55.72**
6	**50**	**3.43**	**14.57**	**52.47**
7	**50**	**3.42**	**14.61**	**52.63**
8	**50**	**3.18**	**15.72**	**56.60**
9	**50**	**2.75**	**18.18**	**65.45**
10	**50**	**3.59**	**13.92**	**50.13**
11	**50**	**3.93**	**12.56**	**45.22**
12	**50**	**4.29**	**11.65**	**41.95**
13	**50**	**3.98**	**12.56**	**45.22**
14	**50**	**3.68**	**13.58**	**48.91**
15	**50**	**3.35**	**14.92**	**53.09**
16	**50**	**3.39**	**14.74**	**53.09**
17	**50**	**3.06**	**16.33**	**58.82**
18	**50**	**2.76**	**18.11**	**65.21**
19	**50**	**3.39**	**14.88**	**53.57**
20	**50**	**2.95**	**16.94**	**61.01**
21	**50**	**3.59**	**13.92**	**50.13**
22	**50**	**2.74**	**18.24**	**65.69**
23	**50**	**2.80**	**17.85**	**64.28**
24	**50**	**2.84**	**17.60**	**63.38**
25	**50**	**3.46**	**14.45**	**52.02**

S.N.	**Dist.(m)**	**Time(s)**	**Speed(m/s)**	**Speed(km/h)**
26	**50**	**3.26**	**15.33**	**55.21**
27	**50**	**3.03**	**16.50**	**59.40**
28	**50**	**3.35**	**14.92**	**53.73**
29	**50**	**3.97**	**12.59**	**45.34**
30	**50**	**3.23**	**14.47**	**55.72**
31	**50**	**2.56**	**19.53**	**70.31**
32	**50**	**3.43**	**14.57**	**52.47**
33	**50**	**3.23**	**15.47**	**55.72**
34	**50**	**3.20**	**15.62**	**56.25**
35	**50**	**2.40**	**20.83**	**75.00**
36	**50**	**3.07**	**16.28**	**58.63**
37	**50**	**3.40**	**14.70**	**52.94**
38	**50**	**3.71**	**13.51**	**48.64**
39	**50**	**3.95**	**12.65**	**45.56**
40	**50**	**3.87**	**12.91**	**46.51**
41	**50**	**4.26**	**11.73**	**42.25**
42	**50**	**3.74**	**13.36**	**48.12**
43	**50**	**4.09**	**12.22**	**44.00**
44	**50**	**3.90**	**12.82**	**46.15**
45	**50**	**4.57**	**10.94**	**39.38**
46	**50**	**4.26**	**11.73**	**42.25**
47	**50**	**4.57**	**11.18**	**40.26**
48	**50**	**3.95**	**12.65**	**45.56**
49	**50**	**3.98**	**12.56**	**45.22**
50	**50**	**3.07**	**16.28**	**58.63**

TABLE :4.8

SPEED RANGE Kmph	MID SPEED (x)	FREQUENCY (f)	%FREQUENCY (%f)	%CUMMULATIVE FREQUENCY (%c .f)	(fx)
20-30	25	0	0	0	0
30-40	35	2	4	4	70
40-50	45	15	30	34	675
50-60	55	21	42	76	1155
60-70	65	10	20	96	650
70-80	75	2	4	100	150
80-90	85	0	0	100	0
90-100	95	0	0	100	0
		∑f=50			∑fx =2700

- AVERAGE SPEED FOR CARS = ∑ f.x / ∑f = (2700/50) = 54 kmph

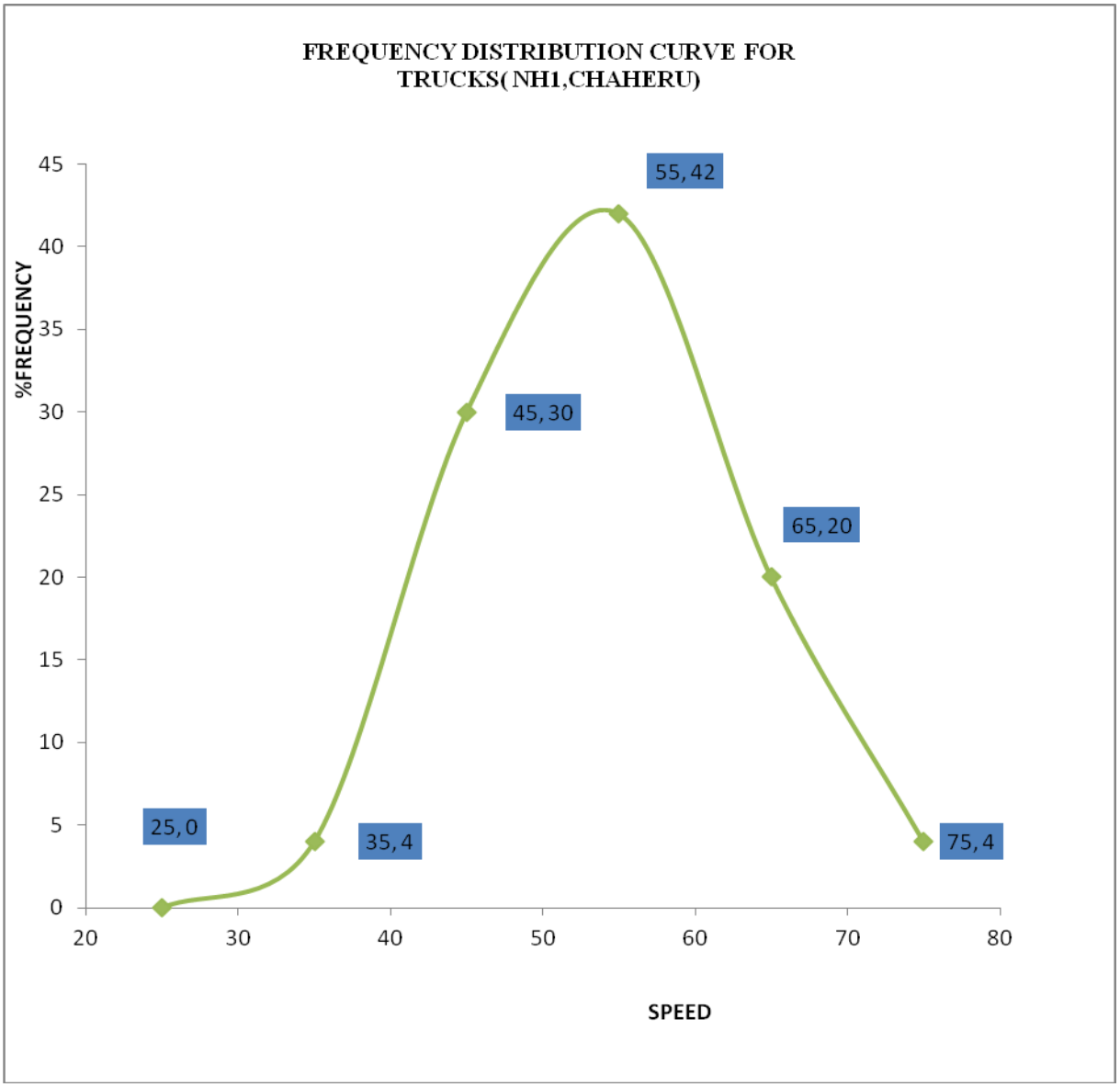


Figure :4.5 frequency Distribution curve for trucks for NH1

- From frequency Distribution curve Modal speed =**55kmph**

Therefore the most preferred speed at which maximum Proportion of trucks travel is the **MODAL SPEED** = **55** KMPH

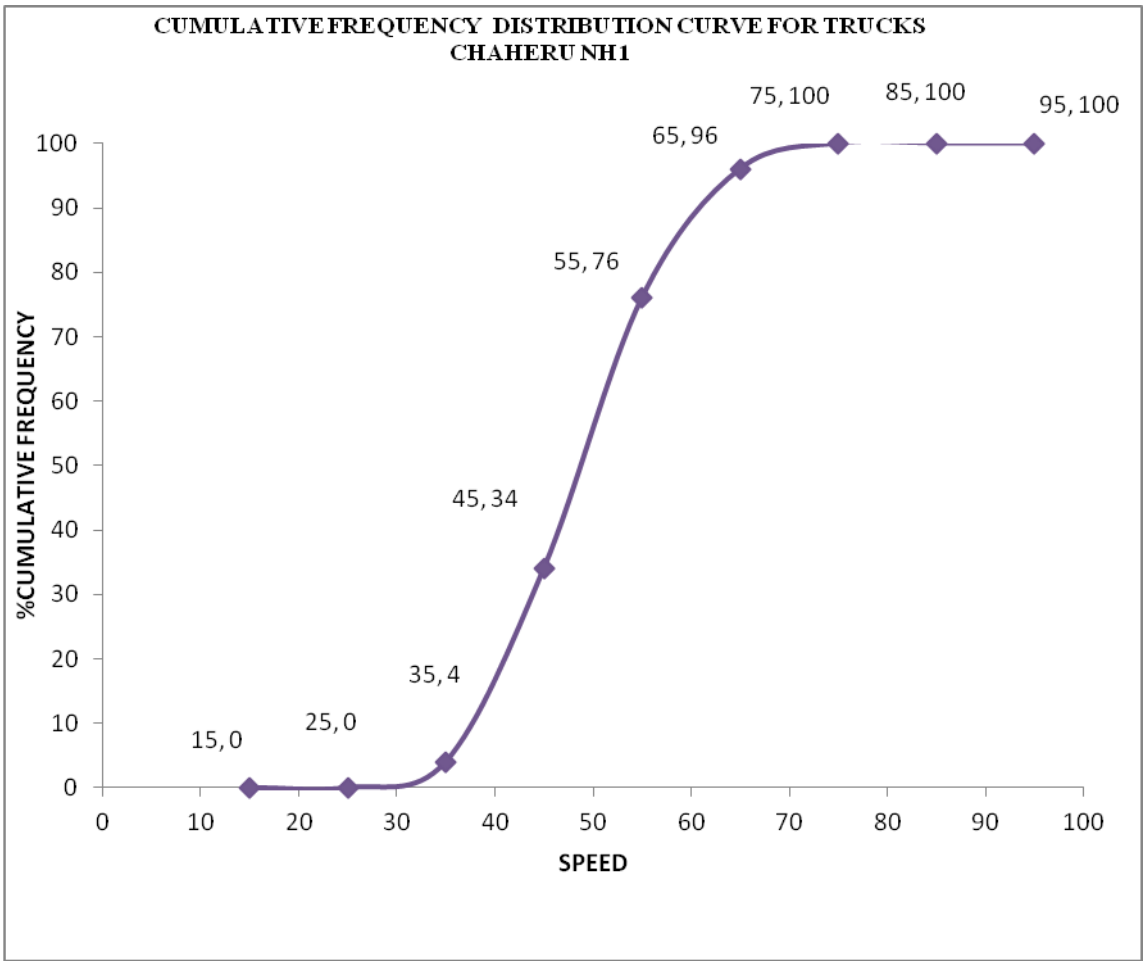


Figure : 4.6 cumulative distribution curve for trucks

❑ FOR NH1 CHAHERU FOR TRUCKS

2. UPPED SPEED = 85th percentile speed

= 60 kmph

2. LOWER SPEED = 15thpercentilespeed

= 40 kmph

3. DESIGN SPEED = 98thpercentile speed

= 70 kmph

4 . MEDIAN SPEED = 50th percentile speed

= 50 kmph

Table : 4.8

SPEED RANGE Kmph	MID SPEED (v)	(q)	(q.v.)	(q/v)
20-30	25	0	0	0
30-40	35	2	70	0.057
40-50	45	15	675	0.333
50-60	55	21	1155	0.381
60-70	65	10	650	0.153
70-80	75	2	150	0.026
80-90	85	0	0	0.000
		∑f=50	∑qv =2700	∑ q/v = 0.95

Space mean speed (Vs) = ∑ (q/v)/(∑f)

= (0.95) /(50)

= 0.019 kmph

Time mean speed (Vt) = ∑qv/∑f

= (2700)/ 50

= 54 kmph

Standard deviation (S^2) = Vs .(Vt -Vs)

= 0.019 (54 - 0.019)

= 1.025

Table :4.9

LOCATION: CHAHERU	**DATE: 2/10/16**
WEATHER: SUNNY DAY	**TIME: 10 A.M. TO 2P.M.**
TYPE OF ROAD : NH1	**BASE LENGTH: 50m**
MEASUREMENT TECHNIQUE: MANUALLY	**VEHICLE: Two wheelers (50)**

S.N.	Dist.(m)	Time(s)	Speed(m/s)	Speed(km/h)
1	50	3.00	16.66	66.00
2	50	2.73	18.31	65.93
3	50	2.68	19.01	68.44
4	50	2.96	16.94	61.01
5	50	3.10	16.12	58.06
6	50	2.63	19.01	68.44
7	50	2.71	18.45	66.42
8	50	3.28	15.24	54.87
9	50	2.52	19.84	71.42
10	50	3.00	16.66	60.00
11	50	2.45	20.40	73.46
12	50	3.19	15.67	56.42
13	50	2.36	21.18	76.26
14	50	2.45	20.40	73.46
15	50	3.03	16.50	59.40
16	50	2.96	16.89	60.81
17	50	2.75	18.18	65.45
18	50	3.63	13.77	49.58
19	50	3.12	16.02	57.69
20	50	2.52	19.84	71.42
21	50	3.46	14.45	52.02
22	50	2.34	21.36	76.92
23	50	3.35	14.92	53.73
24	50	3.03	16.50	59.40
25	50	2.52	19.84	72.42
26	50	2.37	21.09	75.94

S.N.	**Dist.(m)**	**Time(s)**	**Speed(m/s)**	**Speed(km/s)**
27	**50**	**3.23**	**15.47**	**55.72**
28	**50**	**2.45**	**20.40**	**73.46**
29	**50**	**1.70**	**29.41**	**105.88**
30	**50**	**2.17**	**23.04**	**82.94**
31	**50**	**3.19**	**15.67**	**56.42**
32	**50**	**2.42**	**20.66**	**74.38**
34	**50**	**2.67**	**18.72**	**67.41**
35	**50**	**2.87**	**17.42**	**62.77**
36	**50**	**3.00**	**16.66**	**60.00**
37	**50**	**2.36**	**21.18**	**76.27**
38	**50**	**3.35**	**14.92**	**53.73**
39	**50**	**2.20**	**22.72**	**81.81**
40	**50**	**2.24**	**22.32**	**80.00**
41	**50**	**2.51**	**20.00**	**72.00**
42	**50**	**3.15**	**15.87**	**57.15**
43	**50**	**2.73**	**18.31**	**65.93**
44	**50**	**2.68**	**18.65**	**67.16**
45	**50**	**2.71**	**18.45**	**66.42**
46	**50**	**2.45**	**20.40**	**73.46**
47	**50**	**2.43**	**20.57**	**74.07**
48	**50**	**2.13**	**23.47**	**84.50**
49	**50**	**2.60**	**19.23**	**69.23**
50	**50**	**2.40**	**20.83**	**75.00**

TABLE :4.9

SPEED RANGE Kmph	MID SPEED (x)	FREQUENCY (f)	%FREQUENCY (%f)	%CUMMULATIVE FREQUENCY (%c .f)	(fx)
30-40	35	0	0	0	0
40-50	45	1	2	2	45
50-60	55	12	24	26	660
60-70	65	16	32	58	1040
70-80	75	16	32	90	1200
80-90	85	4	8	98	340
90-100	95	1	2	100	95
		∑f=50			∑fx =3380

- AVERAGE SPEED FOR TWO WHEELER = ∑ f.x / ∑f
  = (3380/50)
  = 67.6 kmph

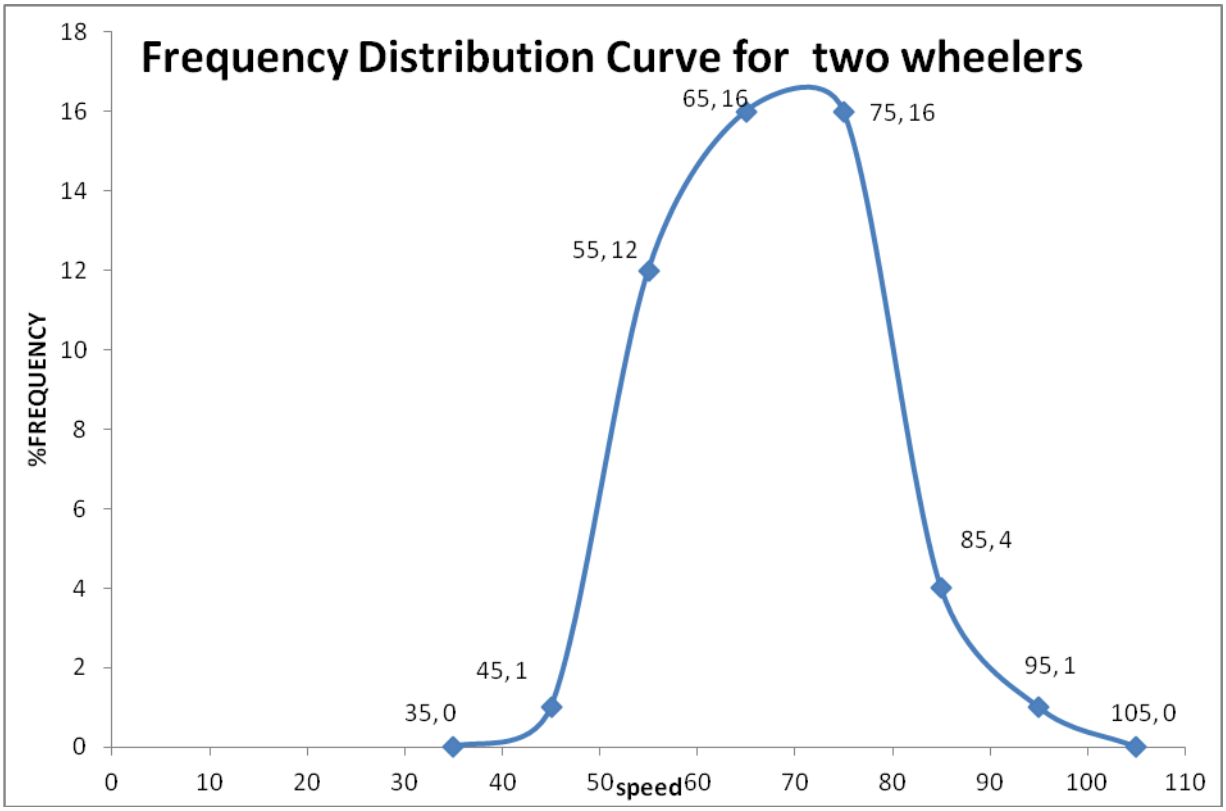


Figure :4.7 frequency Distribution curve for two wheelers for NH1

- From frequency Distribution curve Modal speed = **65 kmph**

Therefore the most preferred speed at which maximum Proportion of trucks travel is the **MODAL SPEED** = **65** KMPH

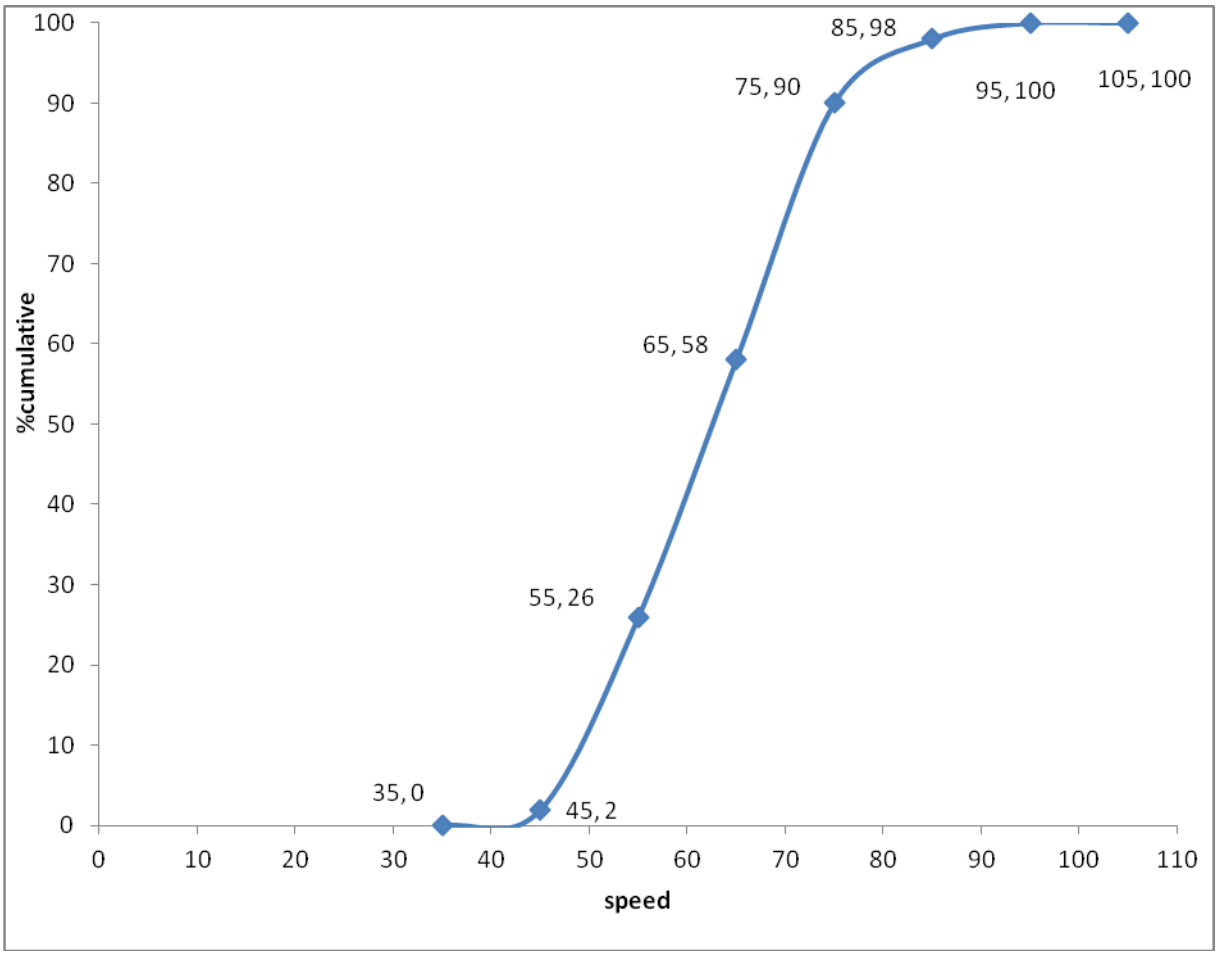


Figure : 4.8 cumulative distribution curve for two wheelers

❑ FOR NH1 CHAHERU FOR TWO WHEELERS

3. UPPED SPEED = 85th percentile speed

= 70 kmph

3. LOWER SPEED = 15thpercentilespeed

= 45 kmph

3. DESIGN SPEED = 98thpercentile speed

= 85 kmph

4 . MEDIAN SPEED = 50th percentile speed

= 60 kmph

Table :4.10

SPEED RANGE Kmph	MID SPEED (v)	(q)	(q.v.)	(q/v)
20-30	25	0	0	0.0
30-40	35	0	0	0.0
40-50	45	1	45	0.0222
50-60	55	12	660	0.2181
60-70	65	16	1040	0.2461
70-80	75	16	1200	0.2133
80-90	85	4	340	0.0470
90-100	95	1	95	0.0105
		∑f=50	∑qv =3380	∑ q/v = 0.7572

Space mean speed (Vs) = ∑ (q/v)/(∑f)

= (0.7572) /(50)

= 0.01514 kmph

Time mean speed (Vt) = ∑qv/∑f

= (3380)/ 50

= 67.6 kmph

Standard deviation (S^2) = Vs .(Vt -Vs)

= 0.01514(67.6 - 0.01514)

= 1.023

Table:4:11

LOCATION: CHAHERU			**DATE: 2/10/16**	
WEATHER: SUNNY DAY			**TIME: 10 A.M. TO 2P.M.**	
TYPE OF ROAD : MAHERU ROAD			**BASE LENGTH: 50m**	
MEASUREMENT TECHNIQUE: MANUALLY			**VEHICLE: Two wheelers (50)**	
S.N.	**Dist.(m)**	**Time(s)**	**Speed(m/s)**	**Speed(km/h)**
1	**50**	**4.84**	**10.33**	**37.19**
2	**50**	**5.53**	**9.04**	**32.55**
3	**50**	**6.19**	**8.08**	**29.08**
4	**50**	**5.99**	**8.35**	**30.05**
5	**50**	**6.27**	**7.97**	**28.71**
6	**50**	**4.18**	**11.96**	**43.06**
7	**50**	**3.88**	**12.89**	**46.39**
8	**50**	**4.57**	**10.94**	**39.39**
9	**50**	**4.31**	**11.60**	**41.76**
10	**50**	**5.17**	**9.67**	**34.81**
11	**50**	**4.95**	**10.10**	**36.36**
12	**50**	**6.53**	**7.66**	**27.57**
13	**50**	**6.43**	**7.78**	**27.99**
14	**50**	**5.83**	**8.58**	**30.80**
15	**50**	**5.43**	**9.20**	**33.15**
16	**50**	**3.91**	**12.79**	**46.03**
17	**50**	**6.02**	**8.31**	**29.90**
18	**50**	**5.46**	**9.16**	**32.97**
19	**50**	**5.62**	**8.90**	**32.03**
20	**50**	**5.96**	**8.39**	**32.20**
21	**50**	**5.18**	**9.65**	**34.75**
22	**50**	**5.63**	**8.88**	**31.97**
23	**50**	**6.19**	**8.08**	**29.08**
24	**50**	**6.69**	**7.47**	**26.91**
25	**50**	**4.62**	**10.82**	**38.96**
26	**50**	**3.01**	**16.61**	**59.80**

S.N.	Dist.(m)	Time(s)	Speed(m/s)	Speed(km/h)
27	50	5.69	08.79	31.63
28	50	5.51	9.07	32.67
29	50	5.70	8.77	31.58
30	50	4.53	11.04	39.74
31	50	5.72	8.74	31.47
32	50	5.11	9.78	35.22
33	50	5.11	9.78	35.23
34	50	3.22	15.53	55.90
35	50	6.96	7.18	25.86
36	50	6.24	8.01	28.85
37	50	6.21	8.05	28.99
38	50	4.20	11.90	42.86
39	50	6.53	7.66	27.57
40	50	6.47	7.73	27.82
41	50	5.66	8.83	31.80
42	50	5.82	8.59	30.93
43	50	6.16	8.12	29.22
45	50	5.09	9.82	35.36
46	50	3.85	12.99	46.75
47	50	5.70	8.77	3.58
48	50	6.79	7.36	26.51
49	50	2.80	17.86	64.28
50	50	7.69	6.50	23.41

TABLE :4.12

SPEED RANGE Kmph	MID SPEED (x)	FREQUENCY (f)	%FREQUENCY (%f)	%CUMMULATIVE FREQUENCY (%c .f)	(fx)
10-20	15	0	0	0	0
20-30	25	15	30	30	375
30-40	35	26	52	82	910
40-50	45	6	12	94	270
50-60	55	2	4	98	110
60-70	65	1	2	100	65
		∑f=50			∑fx =1730

- AVERAGE SPEED FOR TWO WHEELER = ∑ f.x / ∑f

  = (1730/50)

  = 34.6 kmph

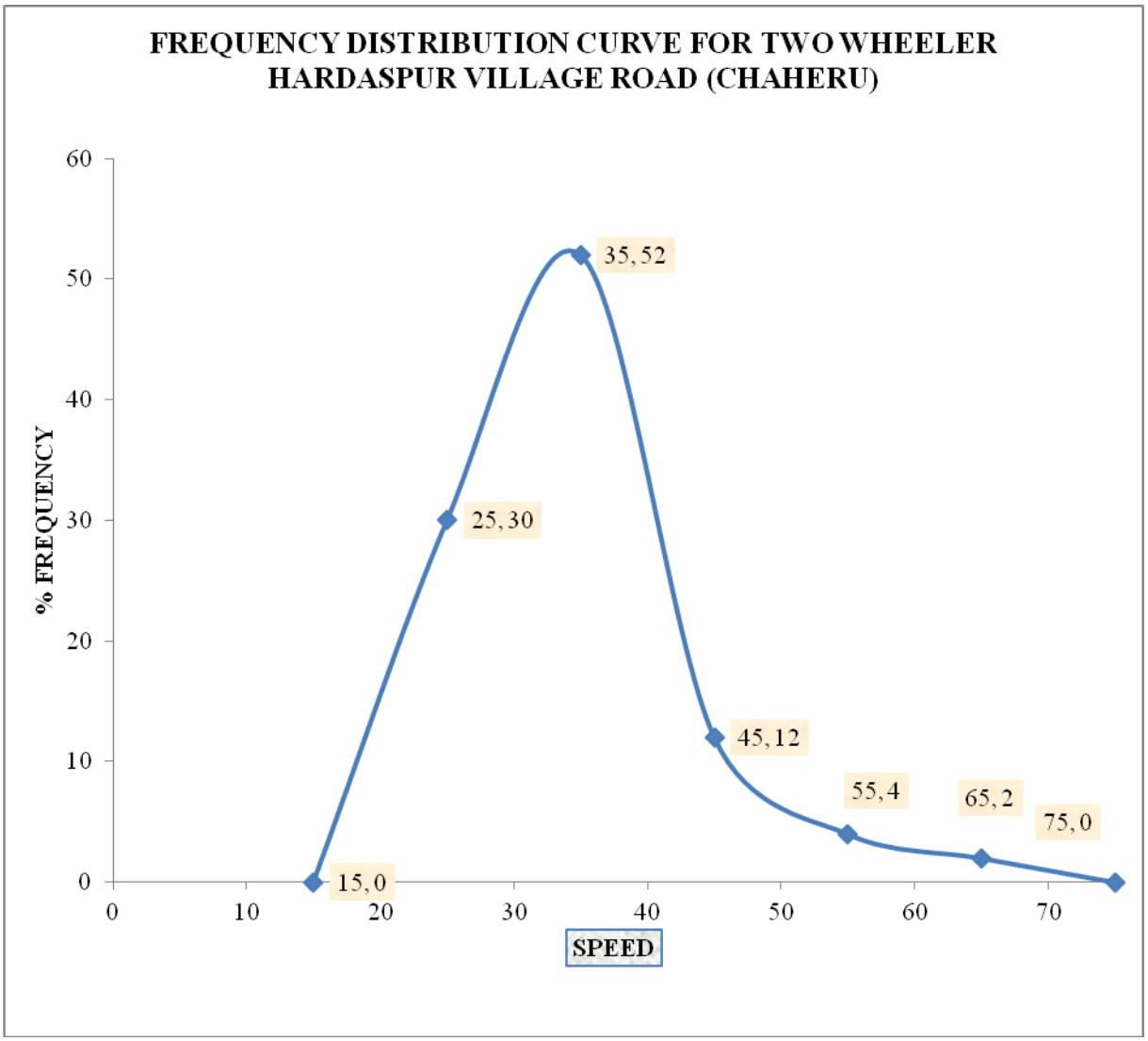


Figure :4.9 frequency Distribution curve for two wheelers for VR

- From frequency Distribution curve Modal speed = **52 kmph**

Therefore the most preferred speed at which maximum Proportion of trucks travel is the **MODAL SPEED** = **52** KMPH

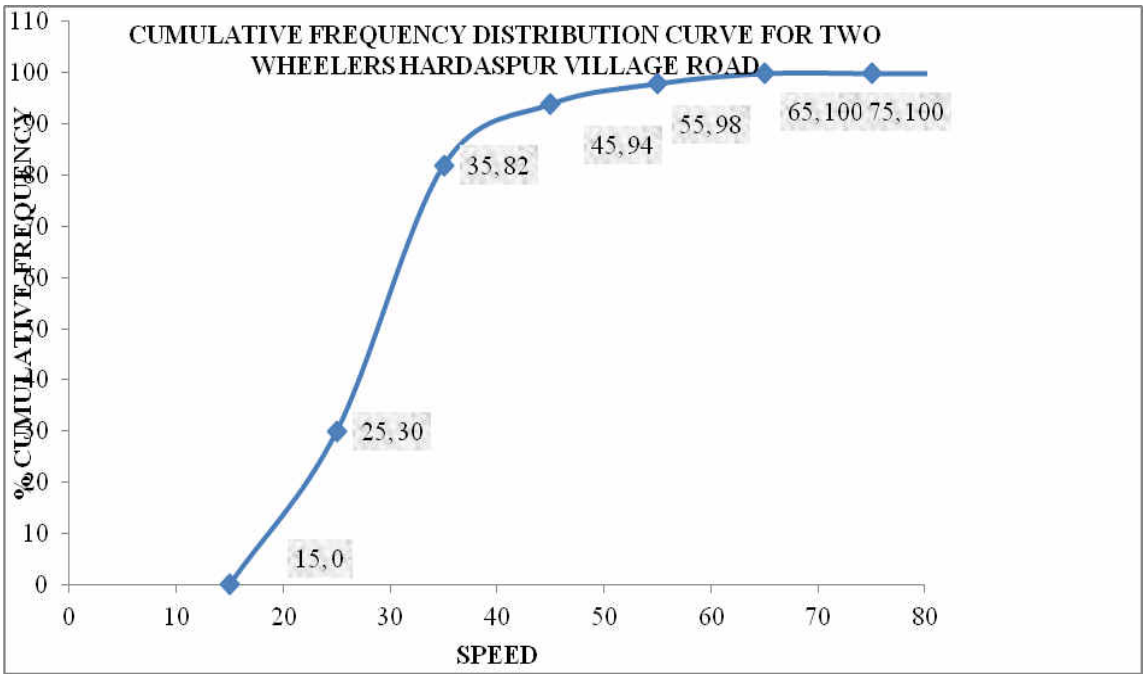


Figure : 4.10 cumulative distribution curve for two wheelers

❑ FOR VR CHAHERU FOR TWO WHEELERS

4. UPPED SPEED = 85^{th} percentile speed

= 40 kmph

4. LOWER SPEED = 15^{th}percentilespeed

= 20 kmph

3. DESIGN SPEED = 98^{th}percentile speed

= 55 kmph

4 . MEDIAN SPEED = 50^{th} percentile speed

= 30 kmph

Table :4.13

SPEED RANGE Kmph	MID SPEED (v)	(q)	(q.v.)	(q/v)
10-20	15	0	0	0.000
20-30	25	15	375	0.600
30-40	35	26	910	0.7428
40-50	45	6	270	0.1333
50-60	55	2	110	0.03636
60-70	65	1	65	0.01538
		∑f=50	∑qv =1730	∑ q/v = 1.90682

Space mean speed (Vs) = ∑ (q/v)/(∑f)

= (1.9068) /(50)

= 0.0381 kmph

Time mean speed (Vt) = ∑qv/∑f

= (1730)/ 50

= 34.6 kmph

Standard deviation (S^2) = Vs .(Vt -Vs)

= 0.0381(34.6 - 0.0381)

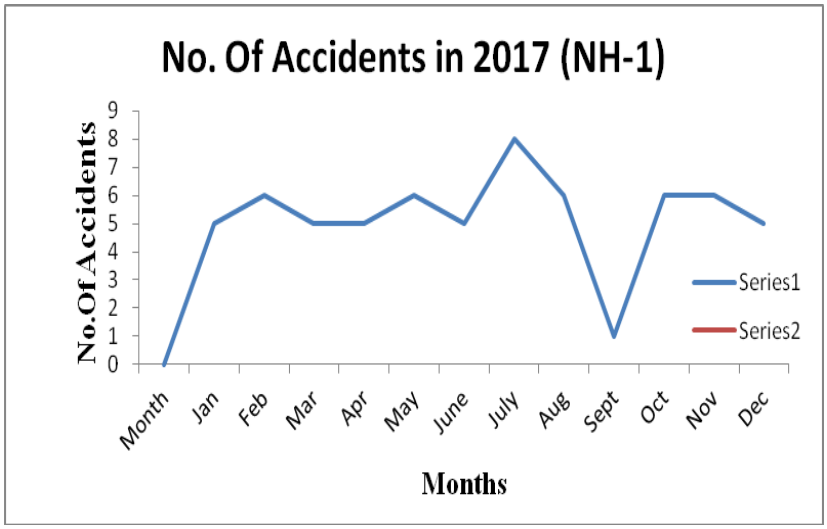
= 1.31

Accidents Data for National Highway One 2016

Table:-

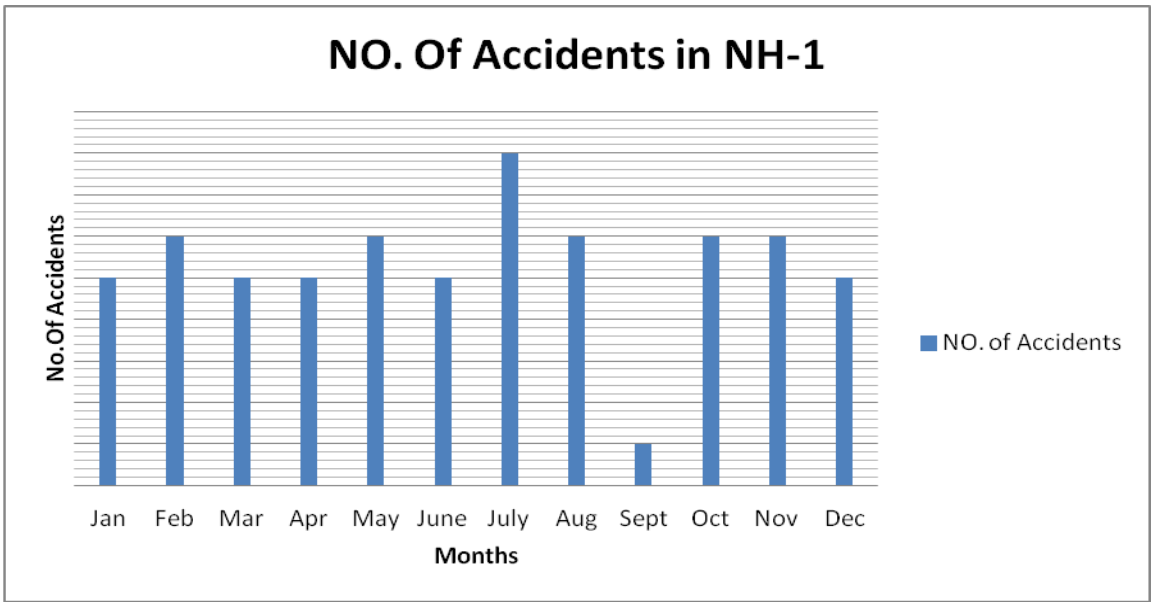
Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
NO. of Accidents	5	6	5	5	6	5	8	6	1	6	6	5

(Sources: DSP Office Phagwara)



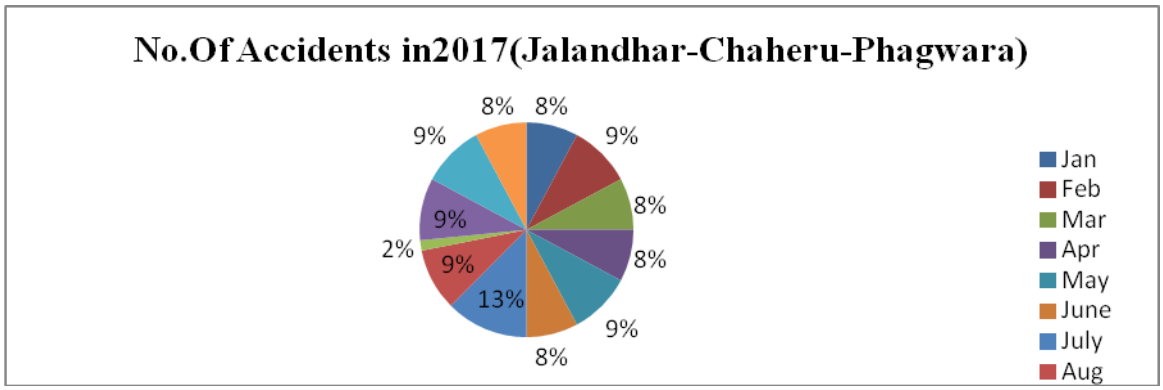
Scatter Chart

Figure NO:



Column Chart

Figure NO:



Pie Chart

RESULTS

- **FOR NHI CHAHERU**
- **MODAL SPEED**
- BUS = **65** kmph
- CAR = **75** kmph
- TRUCK = **55** kmph
- TWO WHEELER = **70** kmph
- **FOR VILLAGE ROAD**
- **MODAL SPEED**
- TWO WHEELER = **35** kmph
- **FOR NHI LUDHIANA**
- **SPEED T0 CHECK DESIGN ELEMENT = 98TH PERCENTILE SPEED**
- FOR BUS = **84 kmph**
- FOR CAR = **100 kmph**
- FOR TRUCK = **85 kmph**
- FOR TWO WHEELER = **100 kmph**
- FOR THREE WHEELER = **73 kmph**

Speed is one of the development operational parts that should be considered in the layout of the road geometrics. The safe acceptable speed most remote indicate will make vehicles go in a sorted out and safe way. The effects of road geometrical design on the speed of the vehicles exhibit that the differences in road geometrical framework would particularly impact the speed of the vehicles. the design speed should be made depending upon the shielded speed limit of the road. The vehicles found in the lower 15 percent are considered to be travelling unreasonably direct and those saw over the 85th percentile are thought to outperform a secured and reasonable speed. 85th percentile could be a govern in setting up the speed limit as this speed is seen as protected and reasonable under conditions states of the road. Strict enforcement should be put in place and violators of speed limits be punished by the enforcement agencies.

CHAPTER 5
FUTURE PROSPECTIVE AND CONCLUSION

The mathematical analysis of the observed data makes it possible to understanding the speed characteristics .spot speed can be represented by frequency distribution curve, cumulative frequency curve and histogram. The next phase will be concerned with the analysis of speed data and results of speed studies. The observed data will be used in future to construct the frequency percent curve of spot speed. The cumulative frequency distribution curve also will be plotted by the help of spot speed data. This data is a very important for graphical representation of the speed distribution and is of the great use in determining the percentile speed in the future. The percentile speed is the speed below which a specified percentage of vehicles travelling. The percentile speed of interest to a traffic engineer percentile is 98^{th} percentile speed, 85th percentile speed, 50thpercentile speed and 15^{th} percentile speed. All these percentile speeds will be determined in next step of project. With the help of collected data, I will determine the design speed for checking the geometric design of the highway and the most preferred speed and rest analysis with result.

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LIST OF ABBREVIATION

%	PERCENTAGE
Dist.	DISTANCE
cm	CENTIMETER
m	METER
m/s	METER PER SECOND
kmph	KILOMETER PER HOUR
s	SECOND
f	FREQUENCY
cf	COMULATIVE FREQUENCY