Road Safety Analysis – A Case Study of National Highway 1-A in India

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Presentation by

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INTRODUCTION

- Road accidents have become a serious problem on 55km long Srinagar-Baramulla road stretch of NH-1A in Kashmir
- In 2010 and 2011:
  - 285 road accidents
  - Approx. 420 fatalities
  - Rate increasing instead of decreasing

Need of a Study:

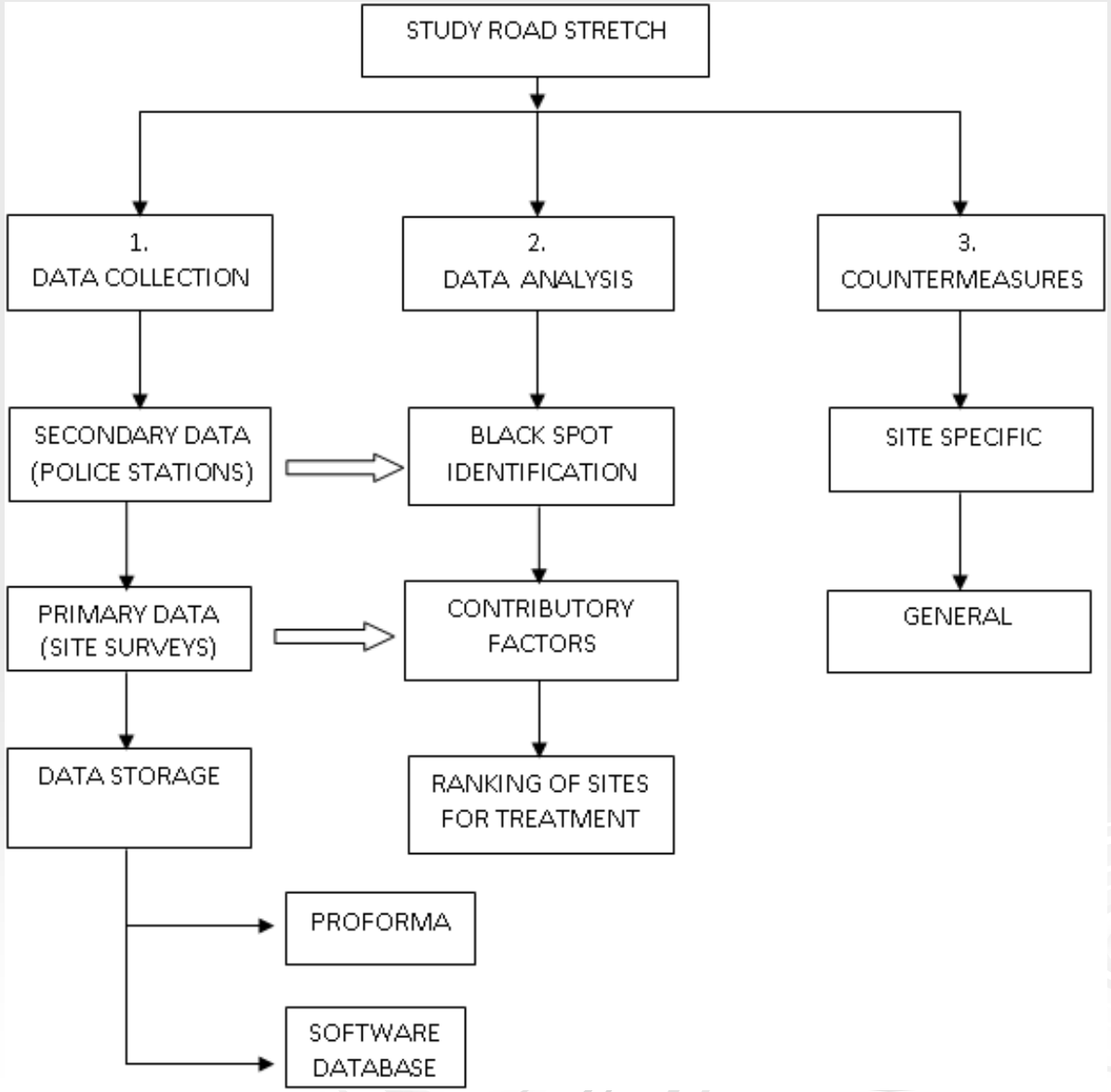
Analyse the Causes and Suggest Countermeasures

STUDY ROAD STRETCH

- Srinagar-Baramulla road stretch of NH-1A-55KM
- Largely a non-urban two way undivided carriageway road
- In general, passes through a plain terrain
- Horizontal and vertical curves
- Passes through built-up areas/market places at places
- Carries a heterogeneous mix of traffic

STUDY ROAD STRETCH

METHODOLOGY



DATA COLLECTION

- **SECONDARY DATA**
- From FIRs
  - Parimpora Police Station (towards Srinagar end)
  - Pattan Police Station
  - Sopore Police Station
  - Baramulla Police Station (towards Baramulla end)

- Included accident date, time, location, collision type, type of vehicles involved, number of deaths/injuries etc.

DATA COLLECTION

- **PRIMARY DATA**
  - Site survey of identified black/unsafe spots

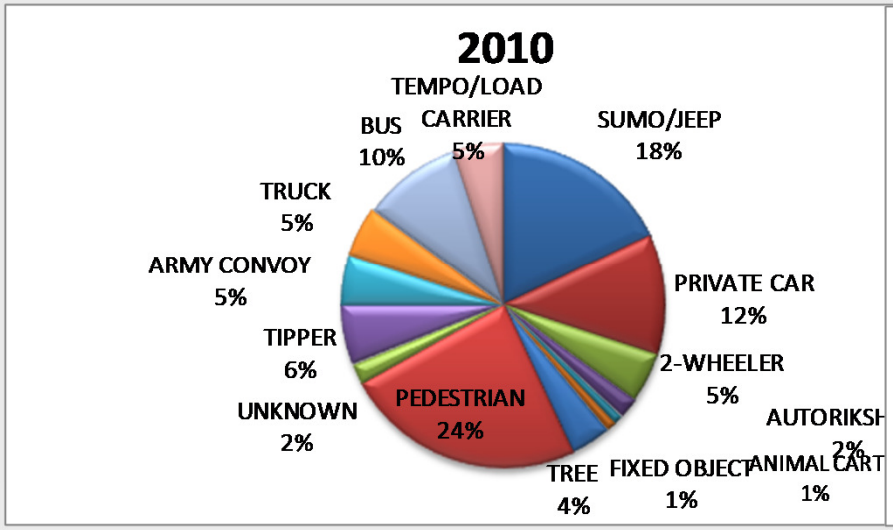
1. Operating speeds
2. Curve details like radius, superelevation, extra widening, safe speed requirement etc
3. Sight distance
4. Vertical grades
5. Carriageway width and Shoulder width
6. Pavement surface condition
7. Presence & nature of road-side developments
8. Open/built-up area
9. Existence of pedestrian crossing facilities
10. Safety barriers, fences
11. Presence of lighting poles, posts, trees etc. at edges
12. Signs and markings
13. Existence of drainage facilities including cross fall and side drains
14. Parked vehicles
15. Side slopes including verge and edge lines
16. Frequent vehicle types

Part of Data Collected at Various Accident Prone Locations or Black Spot Sites

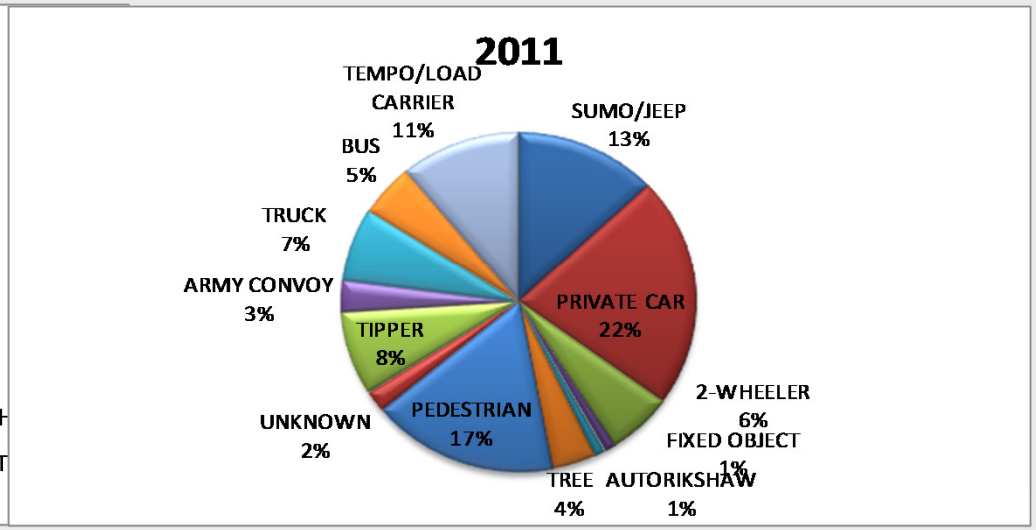
IO	PLACE	R.D	RADIUS (m)	SUPERELEVATION (%)/ CROSS SLOPE	SIGHT DISTANCE (m)	CARRIAGEWAY WIDTH (m)
	Shalteng	1	Large	2.5	400	9
	T.K. College	4.4	150	6	300	9.4
	Laweypora	5.3-5.6	STRAIGHT	2.5	400	9.3
	Mirgund	11.4	130	10	76	9.7
	Zumzum Crossng	19.6	85	6	45	9.1
	Baliharan	12.6-12.7	150	9	90	9.8
	Blind curves between pattan and palhalan	23.1 24.2	60 115	10 5	38 45	9.1
	Palhalan	24.4	135	12	60	13.8
	Hyderbagh	25.6	130	8	170	9.2
	Tappar	28.8-28.9	135	9	76	9.2
	Ringi	30.5-30.8	Large	2.5	220	10
	Puthkhah	34.8	160	8	52	9.6
	Choora	33.5 34	100 110	8 9	82 85	9.3 9.3
	Sangrama	36.7 37.2	110 100	8 8	125 140	9.2 9.2
	Delina	39.3 39.6	130 110	8 8	170 170	9.3 9.3
	Kanispora Curves	41.2 41.8	80 100	9 9	42.6 48.7	9.2 9.2
	Kwajabagh	45.6	300	5	125	9.5

ANALYSIS OF DATA

➢ ANALYSIS OF SECONDARY DATA



Vehicle Type Involvement in Accidents under Pattan P.S Area In 2010



Vehicle Type Involvement in Accidents under Pattan P.S Area In 2011

ANALYSIS OF DATA

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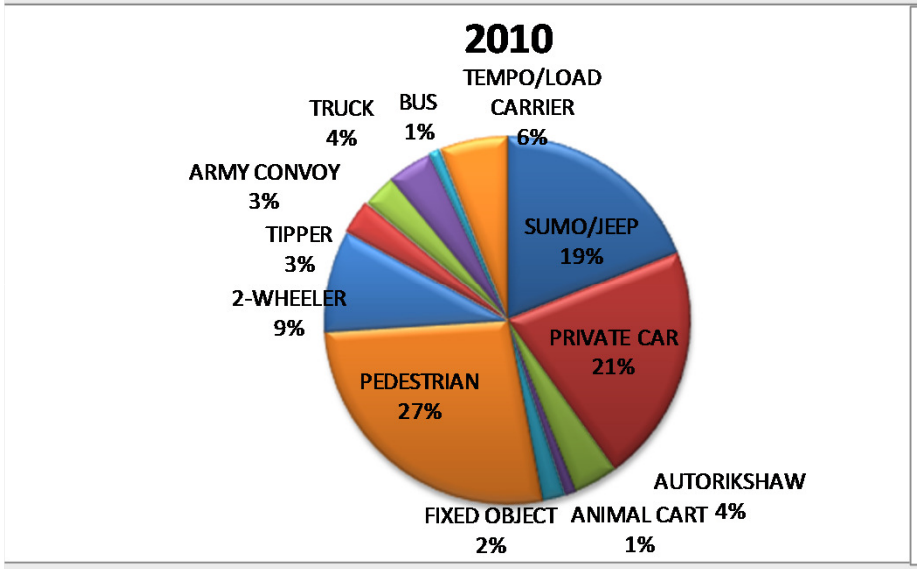
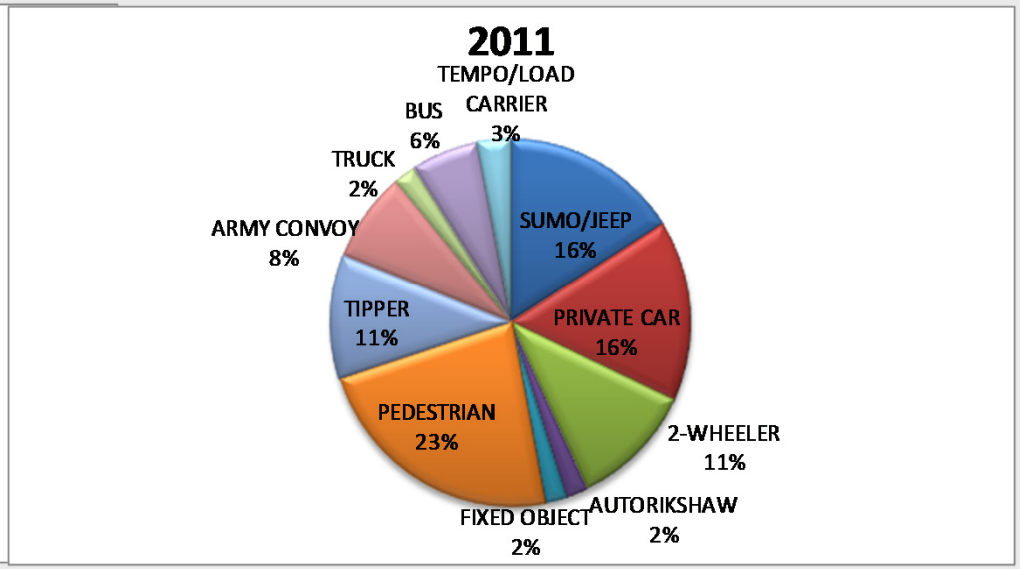


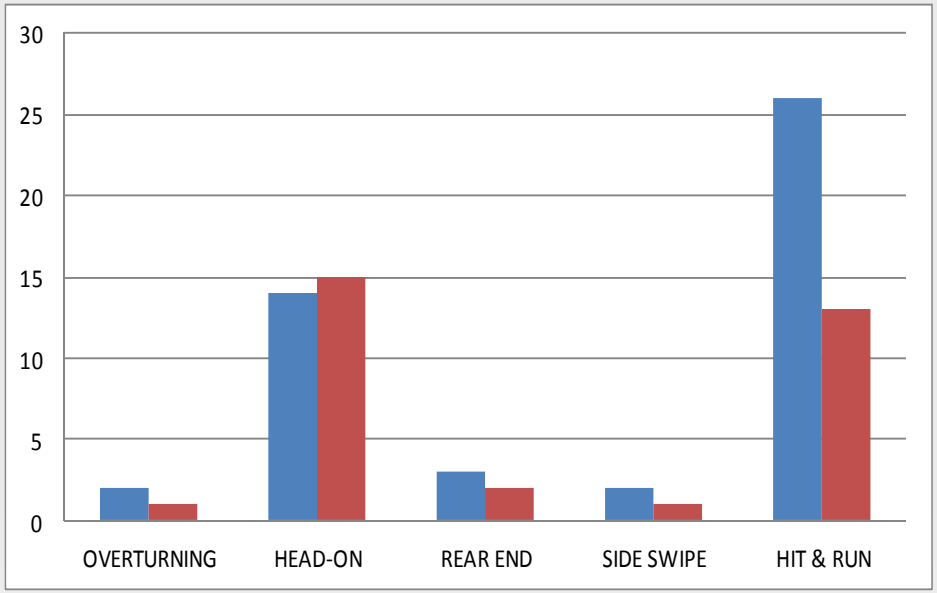
Vehicle Type Involvement in Accidents in Parimpora P.S Area In 2010



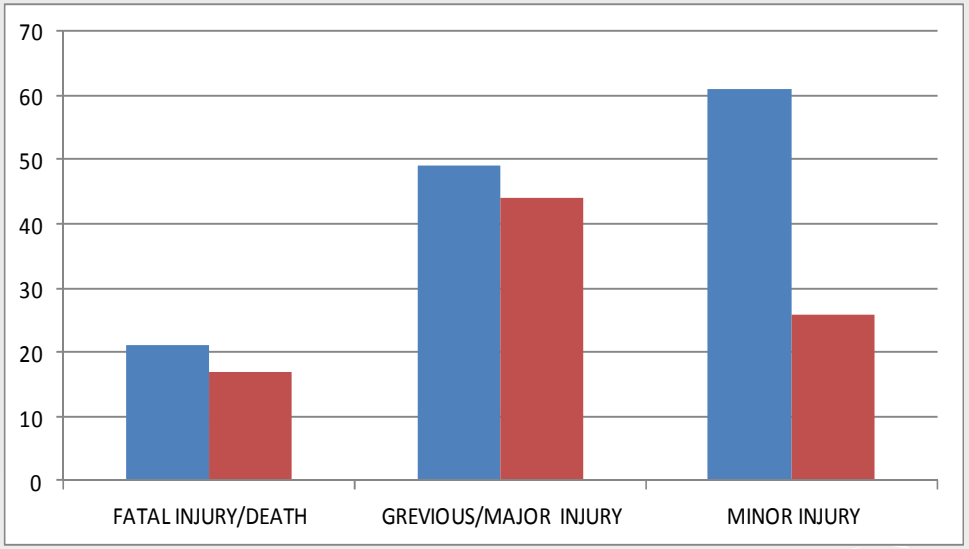
Vehicle Type Involvement in Accidents in Parimpora P.S Area In 2011

ANALYSIS OF DATA

ANALYSIS OF SECONDARY DATA



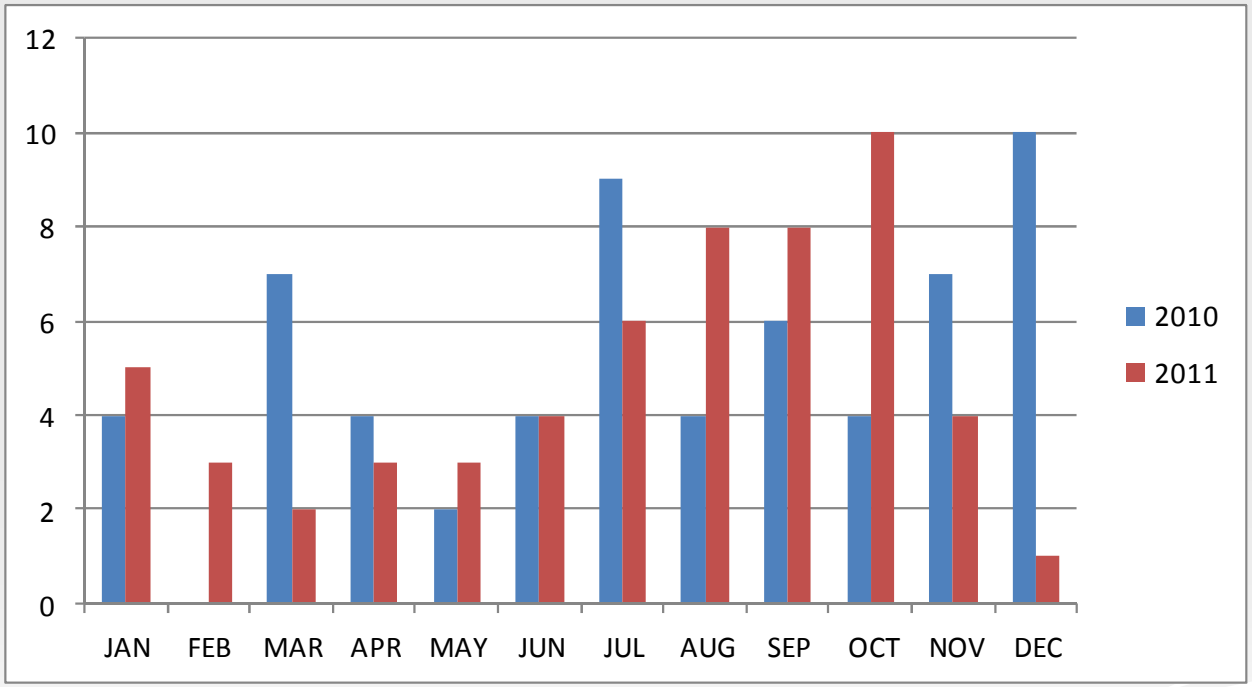
Type of Accidents Occurring under Parimpora P.S Area in 2010-11



Severity of Accidents under Pattan P.S Area in 2010-11

ANALYSIS OF DATA

ANALYSIS OF SECONDARY DATA



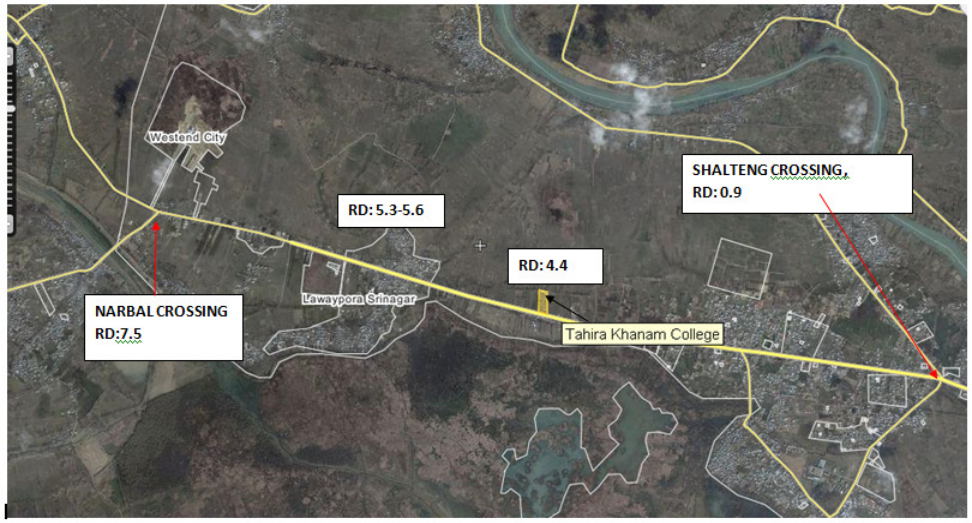
Monthly Frequency of Accidents in Pattan Area in 2010-11

ANALYSIS OF DATA

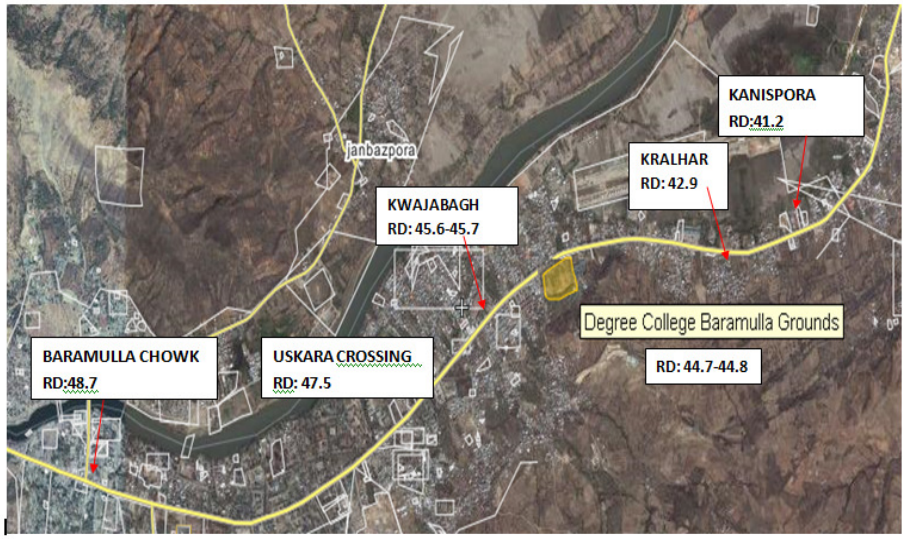
- **Identification of Accident Prone Locations/Black Spots**

- This involves treating a specific site or short length of road by looking for clustering by accident-type, rather than only number
- Based on analysis of secondary data 17 locations identified

ANALYSIS OF DATA



Location of Accident Sites Near Shalteng-Narbal Crossing



Location of Accident Sites on Kanispora-Baramulla Road Stretch

Prioritizing or Ranking of Black Spots/ Accident Prone Locations

- Prioritization involves assigning suitable weights to different factors
- Weights assigned to various factors, which tend to influence the occurrence of accidents on roads on a scale of 0-10
- The factors which tends to increase the probability of the accidents have lower weights.
- Total weight assigned to each location is obtained by adding all the individual weights and normalizing the value using maximum weight (in this case 110) that can be assigned

Prioritizing or Ranking of Black Spots/ Accident Prone Locations

:ode	Factors affecting occurrence of accidents	Possible variations in weight	Weight assigned
A	Relative severity rates =(No. of severity at specific site/ highest no of severity at a site in study stretch)×10	10-9	1
		9-8	2
		8-7	3
		7-6	4
		6-5	5
		5-4	6
		4-3	7
		3-2	8
		2-1	9
		1-0	10
B	Approximate number of vehicles per day	Less than 1000	10
		Less than 2500	7
		Less than 5000	4
		Greater than 5000	1
C	Width of the road	Single lane 3.75 m	2
		Two lanes without raised kerbs, 7.0 m	4
		Two lanes with raised kerbs,7.5m	6
		Intermediate carriageway	8
		Multi-lane pavements	10
D	Drainage facilities provided	Good	10
		Satisfactory	7
		Poor	4
		No Drainage	1
E	Surface condition of the pavement	Concrete	10
		WBM	8
		Other Bituminous	6
		Surface Painted	4
		Bad surface	2
F	Frequent vehicle type on the road	Carts	10
		Two Wheelers	6
		Car/Sumo	4
		Mixed	3
		Bus /Truck	2

Prioritizing or Ranking of Black Spots/ Accident Prone Locations

G	Presence of shoulders	Yes (good) Poor shoulder No shoulder	10 6 4
H	Presence of edge obstructions like advertising hoardings, trees etc very close to the road	Yes No	4 10
I	Provision of median barriers , signs or markings	Yes No	10 4
J	Presence of ribbon development near roads	Yes No	4 10
K	Road Geometric	Straight stretch with no junction Straight stretch with junction Flat curve Sharp curve no junction Sharp curve with junction	10 5 7 3 1

Total weight (Accident prone level (APL)) = (Σ Individual Weights) x 100 / 110

Ranking of Black Spots/ Accident Prone Locations

Assignment of Weights to Accident Prone Locations

Place	A	B	C	D	E	F	G	H	I	J	K	APL
Shalteng	2	3	4	7	6	3	6	5	4	4	5	44.5
T.K. College	5	4	4	7	6	3	3	6	4	7	3	47.1
Lawepora	4	4	4	7	6	3	5	5	4	5	5	47.2
Mirgund	1	4	4	7	6	3	5	4	4	7	1	41.8
Baliharan	7	4	4	7	6	3	6	5	4	6	3	50.0
Hanjiware	6	4	4	7	5	3	6	6	3	6	1	50.0
Zum-zum	3	4	4	7	6	3	6	4	3	5	1	41.8
Pattan	7	3	6	6	4	3	7	3	4	3	7	48.2
Palhalan	7	3	5	8	6	3	6	4	4	6	3	50.0
Hyderbagh	6	3	4	6	6	3	6	5	4	4	3	45.4
Tappar	2	3	4	7	6	3	6	5	4	5	5	45.4
Ringi	3	3	4	7	6	2	6	4	4	5	5	44.5
Puthkhah	7	3	4	7	6	3	6	4	4	6	5	50.0
Choora	7	3	4	5	6	3	6	5	6	6	3	49.0
Delina	7	3	4	7	6	3	6	4	4	5	1	45.4
Kanispora	6	3	4	7	5	3	5	5	5	6	3	47.2
Kwajabagh	3	3	4	6	4	2	6	6	5	5	5	44.5

Ranking of Black Spots/ Accident Prone Locations

- Thus road links/spots with high final weight are less prone to accidents than the road links/spots with low final weight.

Accident Location Prioritization Scheme

Final Weight (%)	Accident Prone Level (APL)
80 - 100	Very Low
60 - 80	Low
40 - 60	Medium
0-40	High

Ranking of Black Spots/ Accident Prone Locations

- Ranking of sites was done on the basis of their APL values

1. Zum-zum crossing
2. Mirgund
3. Shalteng
4. Ringi
5. Kw ajabagh
6. Tappar
7. Hyderbagh
8. Delina
9. T.K college
10. Lawepora
11. Kanispora
12. Pattan
13. Choora
14. Hanjiware
15. Puthkah
16. Baliharan
17. Palhalan

COUNTERMEASURES

➢ SITE SPECIFIC COUNTERMEASURES

Parking of Trucks Decreasing the Road Width Near FCI

No Traffic Control at Shalteng 3-way Junction

COUNTERMEASURES

➢ SITE SPECIFIC COUNTERMEASURES

No Signage Before or After Curve-Pattan Area

No Pedestrian Crossing Facility in Built-up Areas

COUNTERMEASURES

➢ SITE SPECIFIC COUNTERMEASURES

Edge Drop Shoulder Near T.K College

Site Distance Restrictions- Curve near Zum-Zum

COUNTERMEASURES

➢ SITE SPECIFIC COUNTERMEASURES

Broken Gaurd Rail

Damaged Road at Various Locations

COUNTERMEASURES

➢ SITE SPECIFIC COUNTERMEASURES

1. Countermeasures for Shalteng Crossing
RD: 1km
Alignment: 4-arm Junction
Number of accidents: 12 (2 fatal)
Vehicle involvement: Cars, Sumo

Causes :
•Lack of traffic control like signal system
•High approach speeds
•No signage and pavement marking
•Multiple/ wrong maneuvers
•The problem of delay exists for minor road traffic which provokes the drivers to take undue risks in order to enter or cross the main stream.
•Obstruction like poles and trees are very close to pavement edge.

COUNTERMEASURES

➢ SITE SPECIFIC COUNTERMEASURES

➢ **Countermeasures for Shalteng Crossing**

Countermeasures :

Adequate signages and signal system

Local widening of the junction area, allow protected waiting areas to be provided for turning traffic.

Possibility of staggering the legs

Provide roundabout if acquiring of land is possible

Provide median barrier

Restriction on turning movements

COUNTERMEASURES

➢ SITE SPECIFIC COUNTERMEASURES

2. Countermeasures for T.K. College

RD: 4.4km

Alignment: Horizontal curve approaching the college area

Number of accidents: 11(1 fatal)

Vehicles involved: Pedestrian, sumo ,cars

Cause :

High speed

Lack of signage and pavement markings

Edge drop shoulder

High pedestrian movement near college area

COUNTERMEASURES

➢ SITE SPECIFIC COUNTERMEASURES

➢ **Countermeasures for T.K. College**

Countermeasures :

Shoulder widening and sloping

Signage before the approaching curve.

Shifting of main gate of the college from road side to other side which is connected to link road..

Pedestrian crossings near the college area.

Speed barriers/control before the college area

COUNTERMEASURES

GENERAL COUNTERMEASURES

Entire Road Stretch

- Pavement markings at junctions and sharp bends.
- Pre-warning signs before junctions, curves, bridges and residential/market areas
- Give way signs and lane/centerline markings
- Cutting of foliage/trees blocking sight distance
- Underground cabling of electric wires to remove road side poles or shifting of poles
- Stabilization of soft shoulders and leveling/sloping of edge drop shoulder
- Enforcement of speed limits
- Continuous maintenance of roads and improvement of rutted surface as well as repair of potholes
- Pedestrian refuge should be provided at junctions
- Pedestrian crossings should be provided at spots where pedestrian movement is more especially where road passes through built-up/ school/college locations
- Crash barriers to be provided at curves
- Education of drivers and pedestrians regarding safe road use

CONCLUSIONS

- Srinagar-Baramulla road stretch of NH1-A faces serious road safety problems
- Contributed by road related factors as well as operational factors
- The requirement of pedestrian facilities single important factor
- Inadequate curve design is contributing heavily to accident causage
- Sight restrictions at junctions and curves is an important factor
- Traffic controls need to be put in place
- The bad road condition and inadequate maintenance practices need change

THANK YOU