



**IRF WORLD ROAD
MEETING 2017**

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Presentation Title

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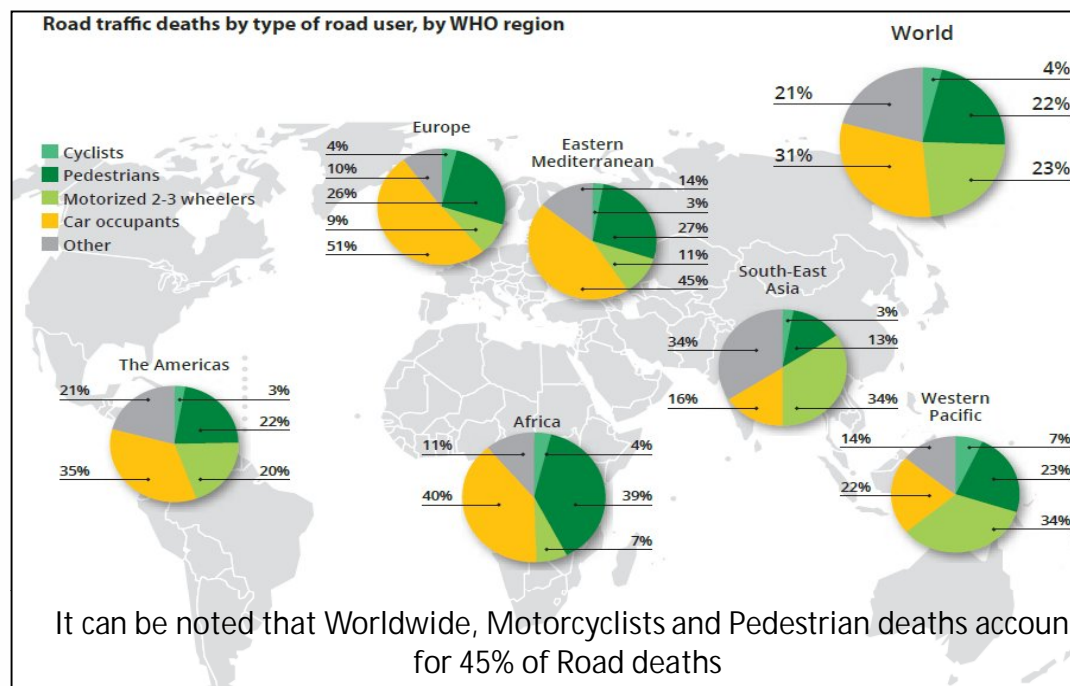
Global Scenario of Road Accidents

➤ The **"Decade of Action for Road Safety 2011–2020"** was officially proclaimed by the United Nations General Assembly in March 2010

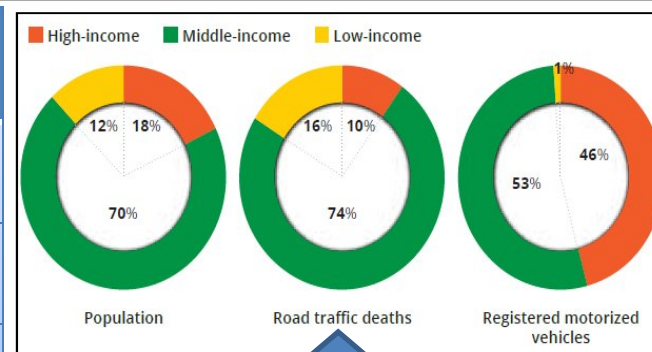
➤ Globally, road traffic crashes is the main cause of death among those aged 15–29 years.

➤ Global Road Injury Mortality rate is 18 deaths per 1 lakh population and for India it is 18.9 with no. of **global deaths 1.25 Million per year**

➤ Middle-income countries have the highest annual road fatality rates, at 20.1 per 1 lakh population, **74 % of road traffic deaths occur in middle-income countries**, which account for 70% of the world's population, but only 53% of the world's registered vehicles.



Type of Country	Deaths per 1 Lakh population	% Global traffic related trends
Low Income Countries	18.3	10%
Middle Income Countries	20.1	74%
High Income Countries	18.7	16%



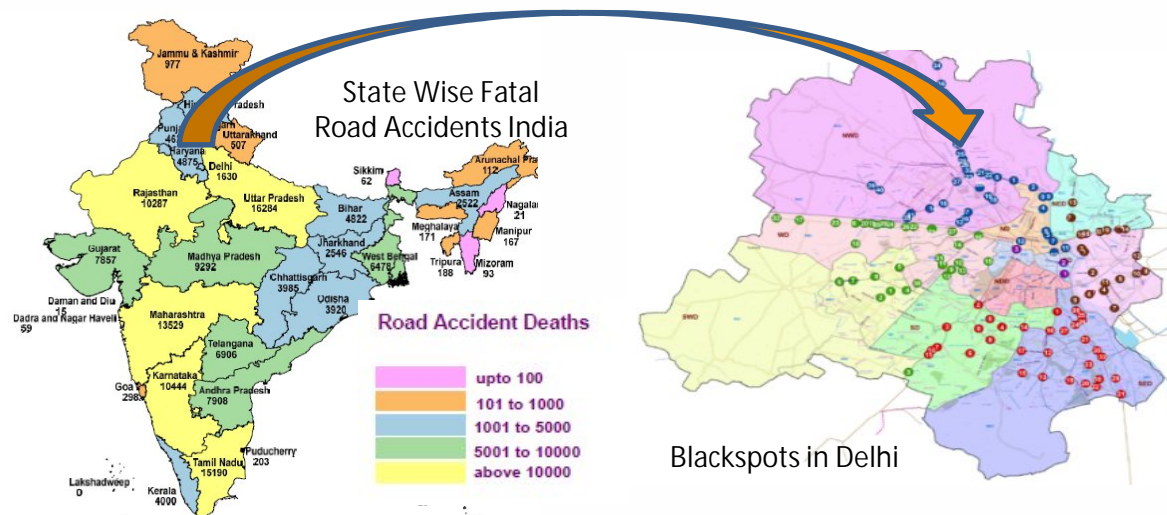
Population, road traffic deaths, and registered motorized vehicles of Countries (Income wise)

"Road Accidents is a major BUT Neglected public health issue worldwide !! "

Indian Scenario of Road Accidents

Statistical Facts

- Road crashes cost up to 3% of the country's GDP.
- The total number of road accidents increased by 2.5% from 4,89,400 in 2014 to 5,01,423 in 2015.
- The total number of persons killed increased by 4.6% from 1,39,671 in 2014 to 1,46,133 in 2015
- Road accidents have injured more than 58000 people in Delhi in last 8 years
- Road accidents have led to death of 15660 people in last 8 years in Delhi.



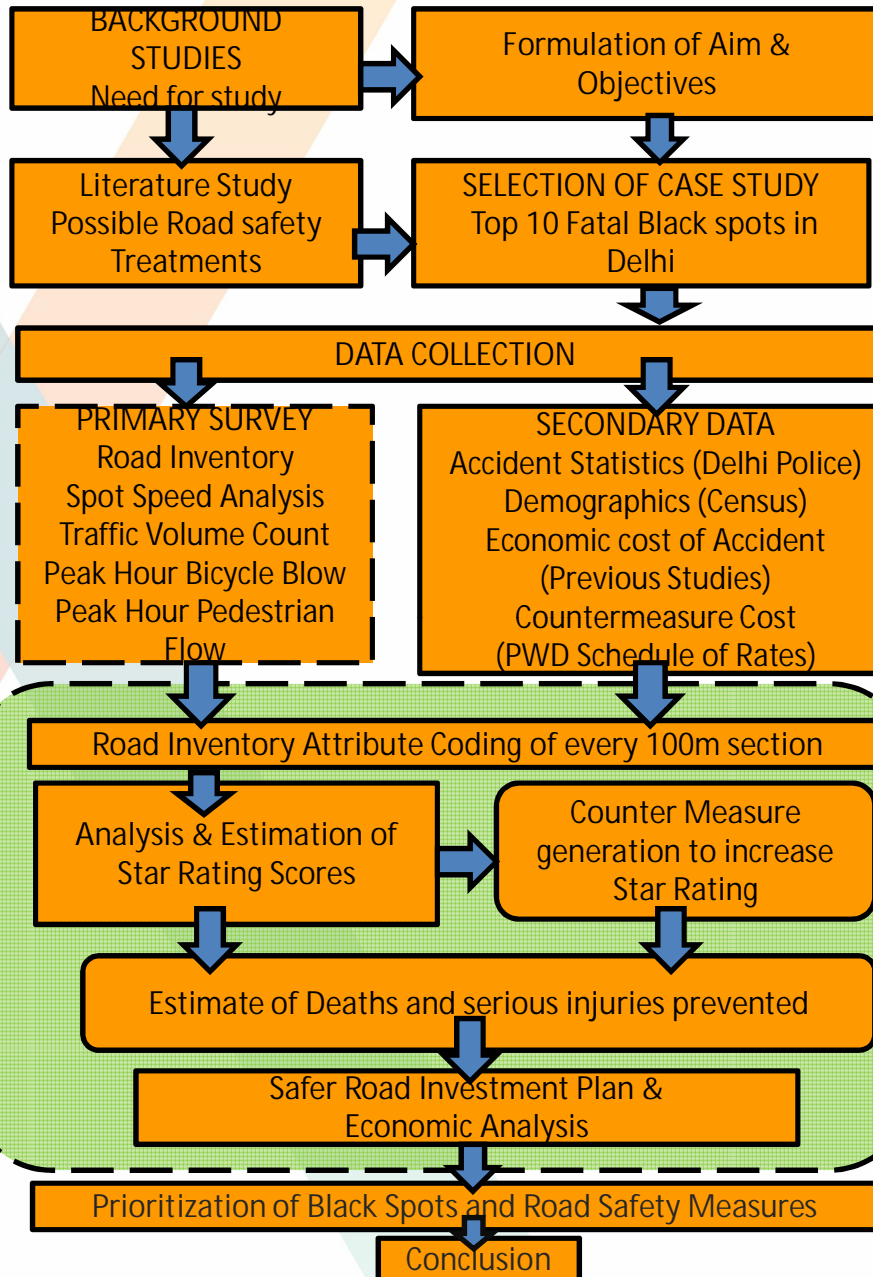
Road Accident Trend in Delhi

Year	Non Fatal Accidents	Fatal Accident	Persons Injured	Persons Killed
2008	6058	2015	7343	2093
2009	5113	2272	6936	2325
2010	5093	2104	7108	2153
2011	5162	2047	6975	2110
2012	5000	1822	6639	1866
2013	5619	1778	7098	1820
2014	6785	1630	8283	1671
2015	6343	1582	8258	1622
Total	45173	15249	58640	15660

ACCIDENT BLACKSPOT

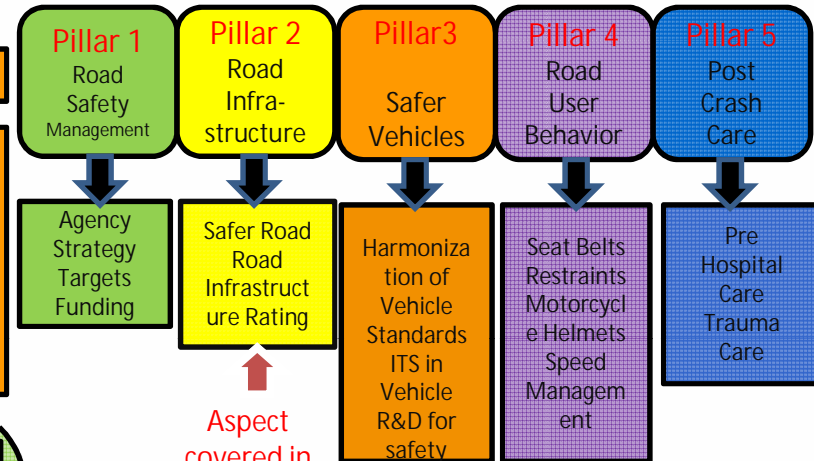
As per Delhi Police an accident black spot has been defined as a place where 3 or more fatal accidents or 10 or more non fatal accidents have taken place in a year

METHODOLOGY



AIM - To develop methodology for prioritization of Road Safety Measures and Accident Black spots

5 Pillars of Road Safety



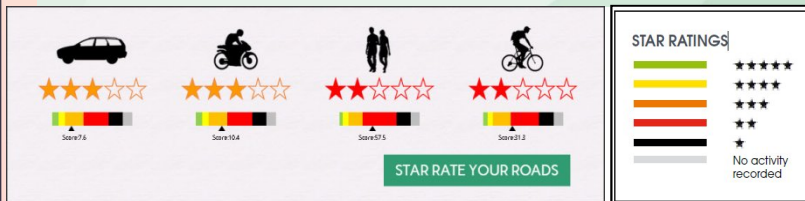
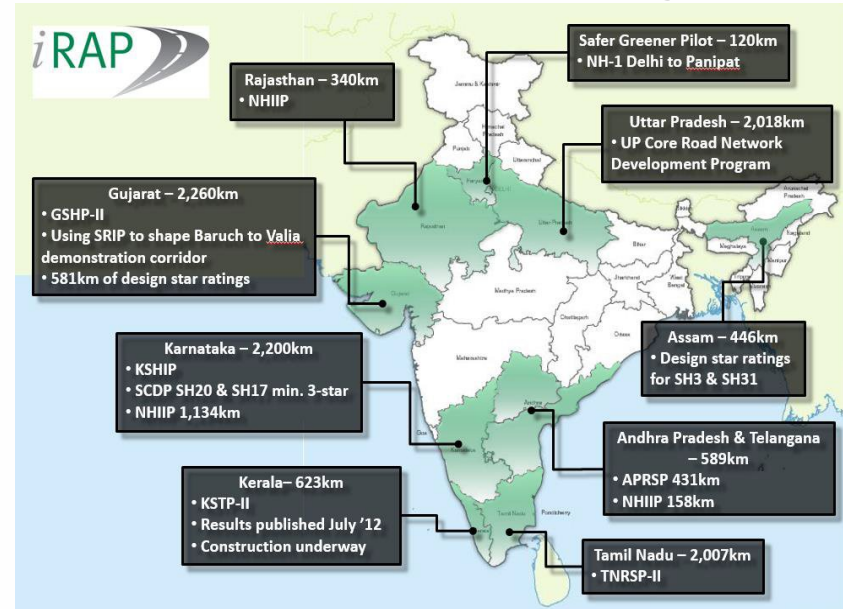
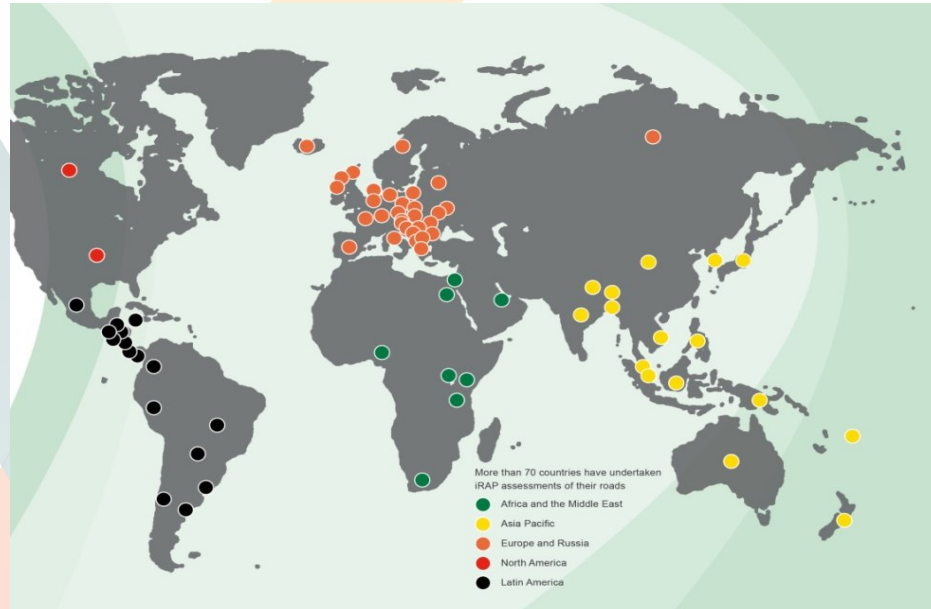
Aspect covered in the research paper

Type of Accident	Economic Cost of Accidents (average)
Fatal	24.34 Lakh
Serious	334500
Major Injury	20627

Note : The economic cost of different types of accidents for Delhi was taken from a previous study done by Arvind Manickam, (2014) Thesis School of Planning and Architecture Delhi

IRAP Software (VIDA)

Introduction to International Road Assessment Program

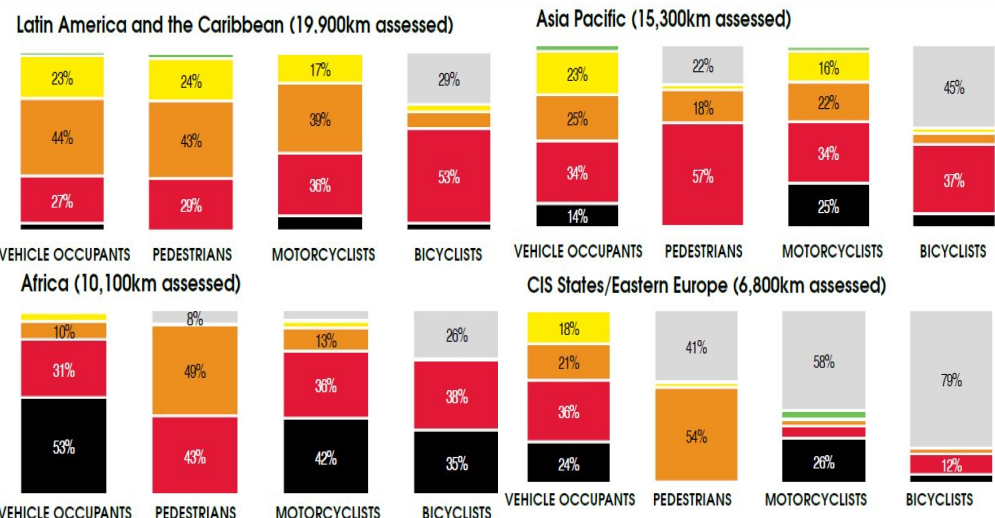


❖ IRAP (International Road Assessment Program) is a registered Charity which Inspect roads and develop Star Ratings

❖ Star Ratings is a measure of the level of safety of different Road Users

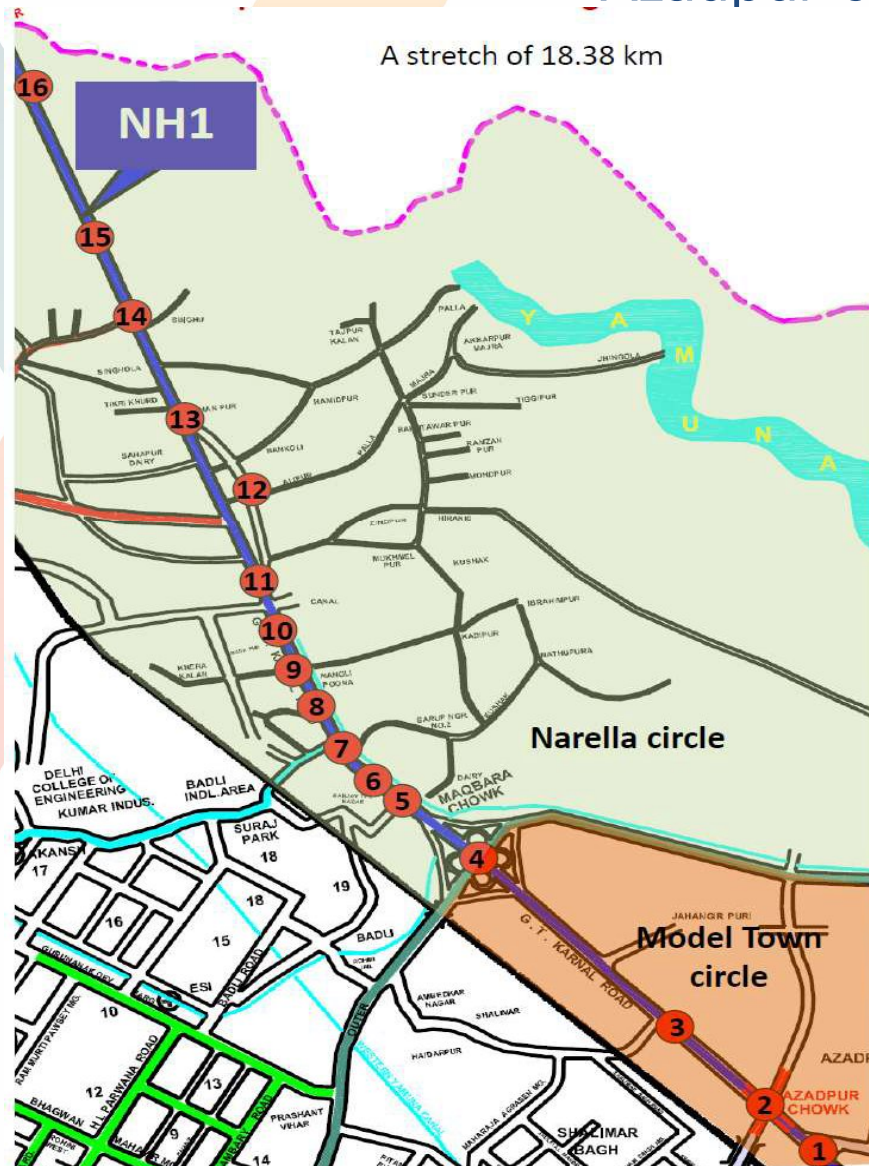
❖ Five-star roads are the safest while one-star roads are the least safe.

❖ IRAP considers more than 90 proven road improvement options to generate economically sound Safer Road Investment Plans (SRIP)



2015 Road Accident Statistics as per Delhi Police

Case Study :- 18.38Km Stretch on NH-44 in Delhi Urban Area Azadpur-Singhu Border



Corridor - Azadpur Bus Terminal to Singhu Border				
S.No.	Accident Prone Zones	Non Fatal Accident	Fatal Accident	Total Accidents
1	Azadpur Bus Terminal	10	1	11
2	Azadpur Chowk	10	8	18
3	Azadpur Sabzi Mandi	10	9	19
4	Mukharba Chowk	4	8	12
5	SGT Nagar	7	8	15
6	CNG Pump SGT Nagar	3	8	11
7	Libaspur Bus Stand	7	3	10
8	Swaroop Nagar	6	4	10
9	Nangli Budhpur	3	7	10
10	Budhpur Ganda Nala	9	4	13
11	Sai Baba Mandir	6	5	11
12	Shani Mandir	6	3	9
13	Bakoli Bus Stand	11	3	14
14	Khampur Village	6	3	9
15	Tikri Khurd Village	8	5	13
16	Singhu Border	7	5	12
	Total	113	84	197

2015 Road Accident Statistics as per Delhi Police

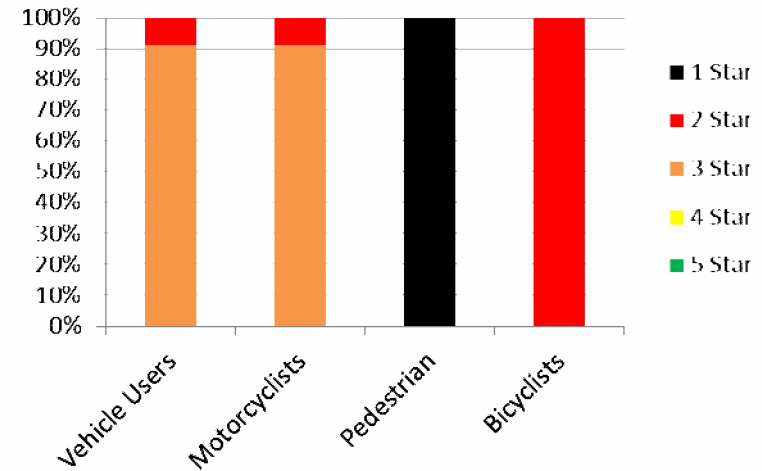
Analysis (Tikri Khurd Village Blackspot)

Star Rating	Vehicle Occupant		MotorCycle		Pedestrian		Bicycle	
	Length (Km)	Percent	Length	%	Length h	%	Length h	%
5 Star	0	0	0	0	0	0	0	0
4 Star	0	0	0	0	0	0	0	0
3 Star	2.1	91	2.1	91	0	0	0	0
2 Star	0.20	9	0.2	9	0	0	2.3	100
1 Star	0.0	0	0	0	2.3	100	0	0
Total	2.3	100	2.3	100	2.3	100	2.3	100

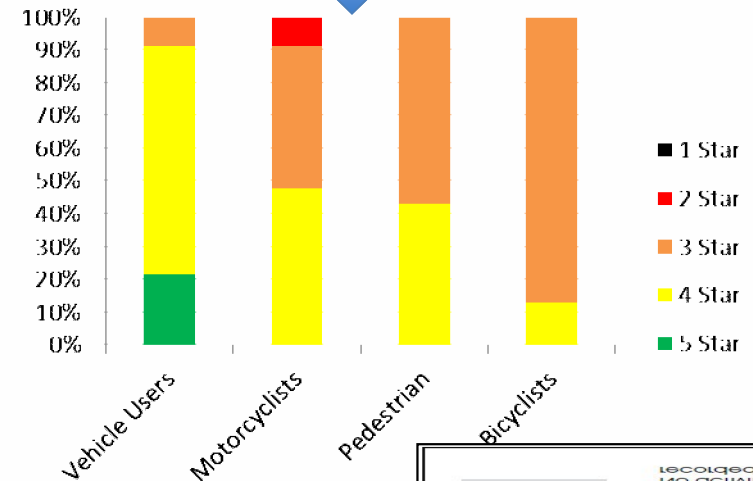
After Countermeasure

Star Rating	Vehicle Occupant		MotorCycle		Pedestrian		Bicycle	
	Length (Km)	Percent	Length	%	Length h	%	Length h	%
5 Star	0.5	22	0	0	0	0	0	0
4 Star	1.6	70	1.1	48	1	43.4	0.3	13
3 Star	0.2	9	1	43	1.3	56.5	2	87
2 Star		0	0.2	9	0	0	0	0
1 Star	0.0	0	0	0	0	0	0	0
Total	2.3	100	2.3	100	2.3	100	2.3	100

Before



After

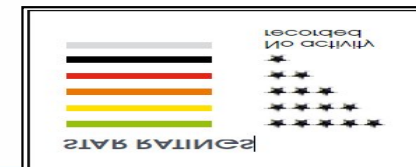
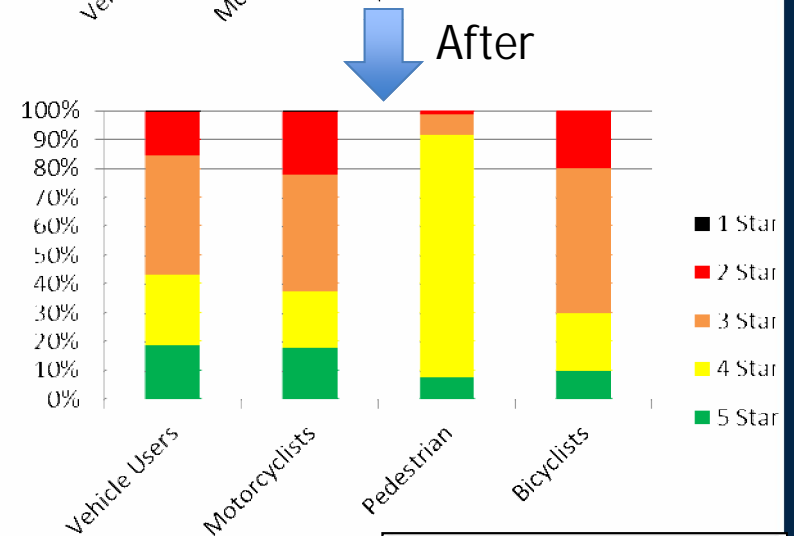
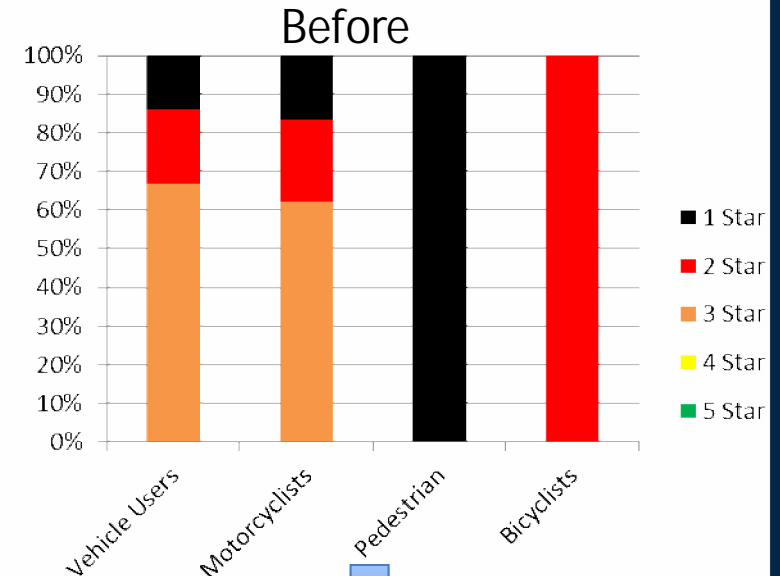


Analysis of Entire Stretch (Both Directions of movement)

Star Rating	Vehicle Occupant		MotorCycle		Pedestrian		Bicycle	
	Length (Km)	Percent	Length	%	Length	%	Length	%
5 Star	0	0	0	0	0	0	0	0
4 Star	0	0	0	0	0	0	0	0
3 Star	24.6	67	22.6	62	0	0	0	0
2 Star	7.00	19	7.7	21	0	0	34.76	96
1 Star	5.1	14	6	17	36.7	100	1.6	4
Total	36.8	100	36.3	100	36.7	100	36.36	100

After Countermeasure

Star Rating	Vehicle Occupant		MotorCycle		Pedestrian		Bicycle	
	Length (Km)	Percent	Length	%	Length	%	Length	%
5 Star	7	19	7	18	3	7.78	5	13
4 Star	9	24	7.37	19	32.26	83.66	0.6	2
3 Star	15.29	41	15.49	40	2.8	7.261	21.06	55
2 Star	5.60	15	8.4	22	0.5	1.297	10.9	28
1 Star	0.1	0	0.1	0	0	0	1	3
Total	36.8	100	38.36	100	38.5	100	38.5	100



Safer Road Investment Plan (Prioritized Hierarchy)

S. No	Road Safety Countermeasures (In decreasing order of Priority with regards to Benefit/Cost ratio of investment in the counter-measure)	Length / Sites	Fatal and serious injuries (FSI) saved	Present Value (PV) of safety benefit (Millions INR)	Estimated Cost (Millions INR)	Cost per FSI saved	Benefit Cost Ratio (BCR)
1	Pedestrian fencing (Highest Priority)	3.10 km	876	171.95	0.06	755	260
2	Improve curve delineation	1.40 km	116	22.7	0.04	2,427	81
3	Shoulder rumble strips	8.27 km	294	57.7	1.06	3,615	54
4	Footpath provision passenger side	29.3 km	1,683	330.16	31.62	18,794	10
5	Signalized Crossing	26 Sites	1,620	317.82	34.21	21,124	9
6	Traffic calming	18.39 km	3,300	647.6	4.75	14,402	14
7	Improve Delineation	32.76 km	641	125.76	16.90	26,379	7
8	Signalized intersection	27 sites	715	140.27	27.2	40,755	5
9	Upgrade Pedestrian Facility	3 Sites	19	3.7	0.8	41,101	5
10	Delineation at Intersection	27 Sites	680	133.5	36.97	54,358	4
11	Protected Turn Lane	9 Sites	409	80.24	20.47	50,075	4
12	Motorcycle Lane (Painted Logos)	3.4 km	12	2.4	0.58	46,553	4
13	Road side Barriers	6.07 km	251	49.28	14.84	59,107	3
14	Protected Turn Lane Improvement	5 sites	127	24.95	8.07	63,511	3
15	Clear Roadside Hazards	4.70 km	123	24.20	8.80	71,377	3
16	Restrict/combine direct access points	2.5 km	98	19.28	6.46	66,039	3
17	Off Road Bicycle Lane	3.4 km	45	8.83	3.33	74,058	3
18	Road Barrier (Driver side)	0.5 km	19	3.79	1.32	68,591	3
19	Grade separated Pedestrian Facility	1	210	41.26	21.99	104,601	2
21	Signalize Side road	8 sites	122	23.88	39.10	321,183	1
22	Segregated Motorcycle Lane	3.07 km	108	6.89	5.72	162,916	1
23	Shoulder sealing	0.47	5	1.25	1.07	35,439	1
Total			9,235	181.2 Crores	32.73	35,439	5.53

An investment of 32.73 Crores on these Black spot can save 9235 Fatal and serious injuries in coming 20 years with an economic benefits of 181.2 Crores and a Benefit/Cost ratio of 5.53

Prioritized Hierarchy of Blackspots

Prioritization Hierarchy	Black Spot	FSI Saved	PV of FSI Saved (Million INR)	Estimated Cost (Million INR)	Cost per FSI Saved	BCR
1	Shani Mandir	974	191.13	20.05	20,539	10
2	Bakoli Bus Stand	94	18.49	2.13	22,583	9
3	Azadpur Bus Stand	170	33.41	4.00	23,530	8
4	SGT Petrol Pump	487	95.58	12.78	26,247	7
5	Tikri Khurd Village	462	90.67	13.09	28,334	7
6	Swaroop Nagar	858	168.45	26.72	31,130	6
7	Khampur Village	735	144.25	23.43	31,880	6
8	Nangli Budhpur	1,430	280.5	48.93	34,233	6
9	Singhu Border	655	128.61	23.13	35,295	6
10	Azadpur Sabzi Mandi	615	120.61	22.02	35,834	5
11	Budhpur Ganda Nala	538	105.65	22.56	41,914	5
12	Sai Baba Mandir	673	132.05	29.05	43,172	5
13	Azadpur Chowk	247	48.38	13.17	53,449	4
14	Mukarba Chowk	565	110.93	33.50	59,262	3
15	SGT Nagar	104	20.36	7.62	73,474	3
16	Libaspur Bus Stand	227	18.25	6.02	80,254	3

Inference

Prioritization of Blackspots suggests Shani Mandir on NH-44 has highest priority with cost per FSI saved 20,539 rupees & BCR 10.


Conclusion & Way Forward

CONCLUSION

- The 16 Black Spots in Delhi have 52% of road stretch with 3 star rating for Vehicles, 50% of stretch has 2 star rating for Motorcyclists, 38% has 1 star rating for pedestrians, 34% has 2 star rating for Bicycles
- An investment of 32.73 Crores on these Black spot can save 9235 Fatal and serious injuries in coming 20 years with an economic benefits of 181.2 Crores and a Benefit/Cost ratio of 5.53
- Prioritization of Blackspots suggests Shani Mandir on NH-44 has highest priority with cost per FSI saved 20,539 rupees & BCR 10.

WAY FORWARD

- Star Rating is not sensitive towards assessing potential impact of ITS. Research on impact of ITS in Infrastructure, Vehicles & enforcement measures can be done and integrated with Road infrastructure rating to further enhance Road safety.
- Diurnal Variation in Star rating of Road Infrastructure components and corresponding Countermeasures can further make roads more safe.



Thank You