

Road Safety Assessment using iRAP – Case Study of National Highway

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Abstract:- Black spots with high crash frequency were identified through the recording of accidents from FIR reports or which is simply through secondary data collection before this number of accidents and number of persons (killed, grievous, minor) injured are identified for the selected study area NH44 (Devanahalli toll plaza to Bagepalli toll plaza) using FIR report data of the particular police stations under study area. Then the remedial measures are suggested based on factors contributing to road crashes that were identified on the selected concerned black spots. Remedial measures are suggested for the particularly selected black spots from identified black spots by road safety audit, audit performed for this study is the safety performance examination of an existing road at intersections, to provide remedial measures so as to mitigate the impact of accidents through the use of IRC Codal provisions, the factors contributing accidents. Risk Maps use detailed crash data to illustrate the actual number of deaths and injuries on a road network. Star Ratings provide a simple and objective measure of the level of safety provided by a road's design. Safer Roads Investment Plans draw on approximately 90 proven road improvement options to generate affordable and economically sound infrastructure options for saving lives.

I. INTRODUCTION

i-RAP – International Road Assessment Programme. A scientific methodology to assess the safety of a road network in terms of various road user category and rank the network based on it. i-RAP- detailed crash data, Star Rating and safer road investment plan. 150 thousand people are killed from 450 thousand of road traffic crashes every year. Road Safety Audit - the formal safety performance examination of an existing or future road. National Highways (NHs) comprise of less than 2% of the entire road network, but account for more than 35% of total traffic fatalities. intersections with most potential for crash frequency and what are the major factors contributing to road crashes/accidents as Road accidents continue to be a leading cause of death, disabilities and hospitalization in the country despite of commitment and efforts. India ranks first in the number of road accident deaths across the 195 countries and accounts for almost 11% of the accident related deaths in the World. Then the remedial measures are suggested based on factors contributing to road crashes that were identified on the selected concerned black spots.

II. OBJECTIVES

- To conduct Star Rating of 75 km road stretch from Bagepalli Toll Plaza to Devanahalli Toll Plaza (NH44).
- To suggest countermeasures required road stretches based on the obtained star ratings.

III. METHODOLOGY

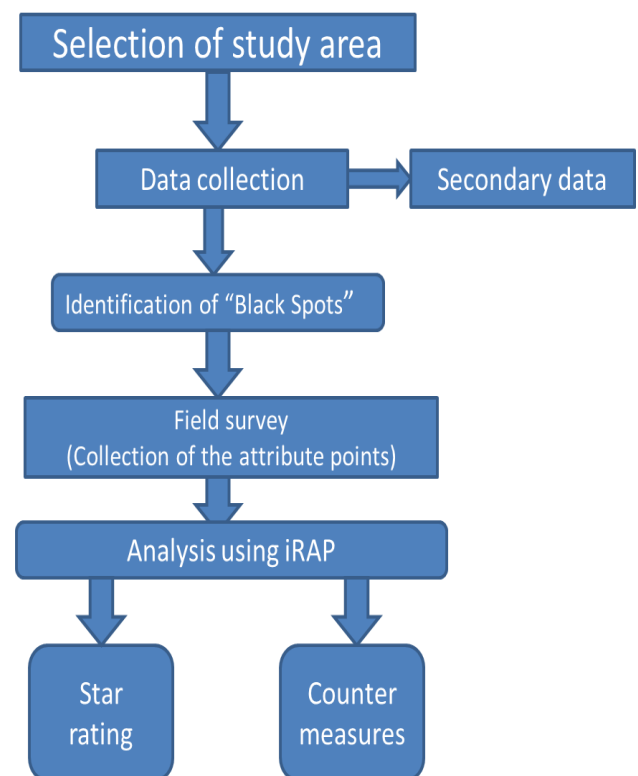


Fig 1 Flow Chart of Methodology

A. Study Area



Fig 2 Study Area

It is previously known as NH-7 but now a days it is known as NH-44. It is the largest National highway(NH-7) in India. In this highway we are considering Devanhalli toll plaza to Bagepalli toll plaza.It is 75 km long. NH-44 was laid and is maintained by central public works.

B. Data Collection

From seven police stations which are comes under our stretch, we collected the data related to accident identification details, road related details, vehicles details, driver details and persons involved in the accident. We collected the FIR data from www.ksp.karnataka.gov.in

Table 1 Total Number of Accidents Classified According to Year 2018-2022

Year	Number of Accidents					Number of Persons			
	F	G	M	NI	Total	K	GI	MI	Total
2018	61	112	10	41	224	69	268	41	378
2019	74	134	8	42	258	92	369	44	505
2020	66	138	6	40	250	73	385	31	489
2021	62	125	6	29	222	78	226	19	323
2022	62	148	10	32	252	65	270	13	348
Total	325	657	40	184	1206	377	1518	148	2043

C. Identifications of Block Spots

Following black spots are selected based on MoRTH definition. These identified black spots are according to total number of deaths per year 3 and total number of accidents per year 5, Following black sport are the top 10 as follows,

Table 2 Total Number of Accidents Classified According to Blackspot

Name of the Blackspot	Number of Accidents					Number of Persons			
	F	G	M	NI	Total	K	GI	MI	Total
Green Park Dhabha	7	12	2	5	26	10	15	0	25
Sunkamma Temple	4	7	0	0	11	6	11	0	17
Paragodu	8	11	3	4	26	9	16	5	30
Chanduru	5	9	0	6	20	7	8	0	15
Sadali	4	8	2	3	17	5	12	3	20
Aruru gate	7	12	3	4	26	8	15	4	27
Kannamangala Gate	12	18	6	8	44	20	22	8	50
Inimichenahalli	5	10	0	6	21	8	8	0	16
Lingashettipura	3	8	1	4	16	5	12	2	19
Reddygollavarahalli	7	12	0	5	24	10	17	0	27
hunegal	8	13	4	3	28	10	18	5	33
Doddapylagurki	10	15	4	5	34	18	21	6	45
Harobande	7	12	2	4	25	10	15	4	29
Honnenahalli	5	9	2	4	20	7	10	4	21
Vapasandra flyover	4	7	2	3	16	5	11	4	20
Agalagurki Flyover	6	6	1	3	16	5	9	2	16

From the above table, we have selected top 10 blackspots for iRAP analysis. i.e.,

- Sadali
- Aruru gate
- Inimichenahalli
- Reddygollavarahalli
- Hunegal

- Doddapylagurki
- Harobande
- Honnenahalli
- Vapasandra flyover
- Agalagurki flyover

D. Field Data / Collection of Attributes

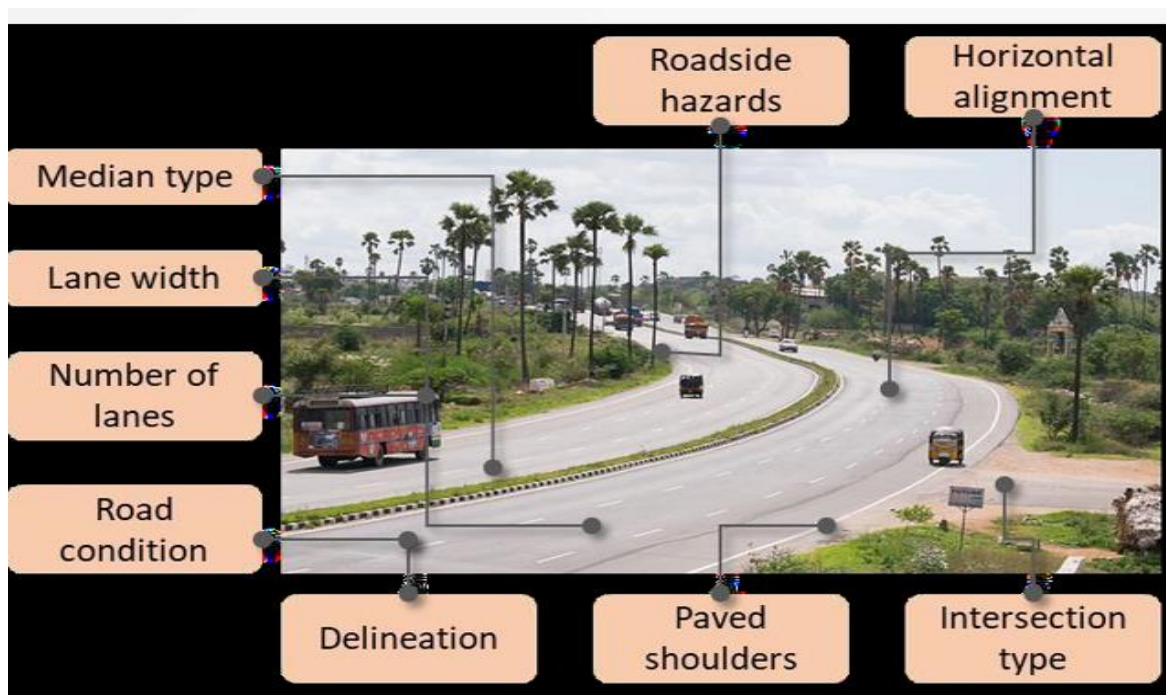


Fig 3 Field data / Collection of Attributes

The following attributes are required for iRAP analysis:-

➤ Road side

- Roadside severity - driver-side distance
- Roadside severity - driver-side object

- Roadside severity - passenger-side distance
- Roadside severity - passenger-side object
- Shoulder rumble strips
- Paved shoulder - driver-side
- Paved shoulder - passenger-side

➤ *Mid-block*

- Carriageway label
- Upgrade cost
- Median type
- Centreline rumble strips
- Number of lanes
- Lane width
- Curvature
- Quality of curve
- Grade
- Road condition
- Skid resistance / grip
- Delineation
- Street lighting
- Vehicle parking
- Service road
- Roadworks
- Sight distance

➤ *Intersections*

- Intersection type
- Intersection channelisation
- Intersecting road volume
- Intersection quality
- Property access points

➤ *Flow*

- Vehicle flow (AADT)
- Pedestrian peak hour flow across the road
- Pedestrian peak hour flow along the road driver-side
- Pedestrian peak hour flow along the road passenger-side
- Bicyclist peak hour flow

IV. ANALYSIS USING IRAP

From the above attributes by using vidaiRAP. We are considered star rating of the following blackspport

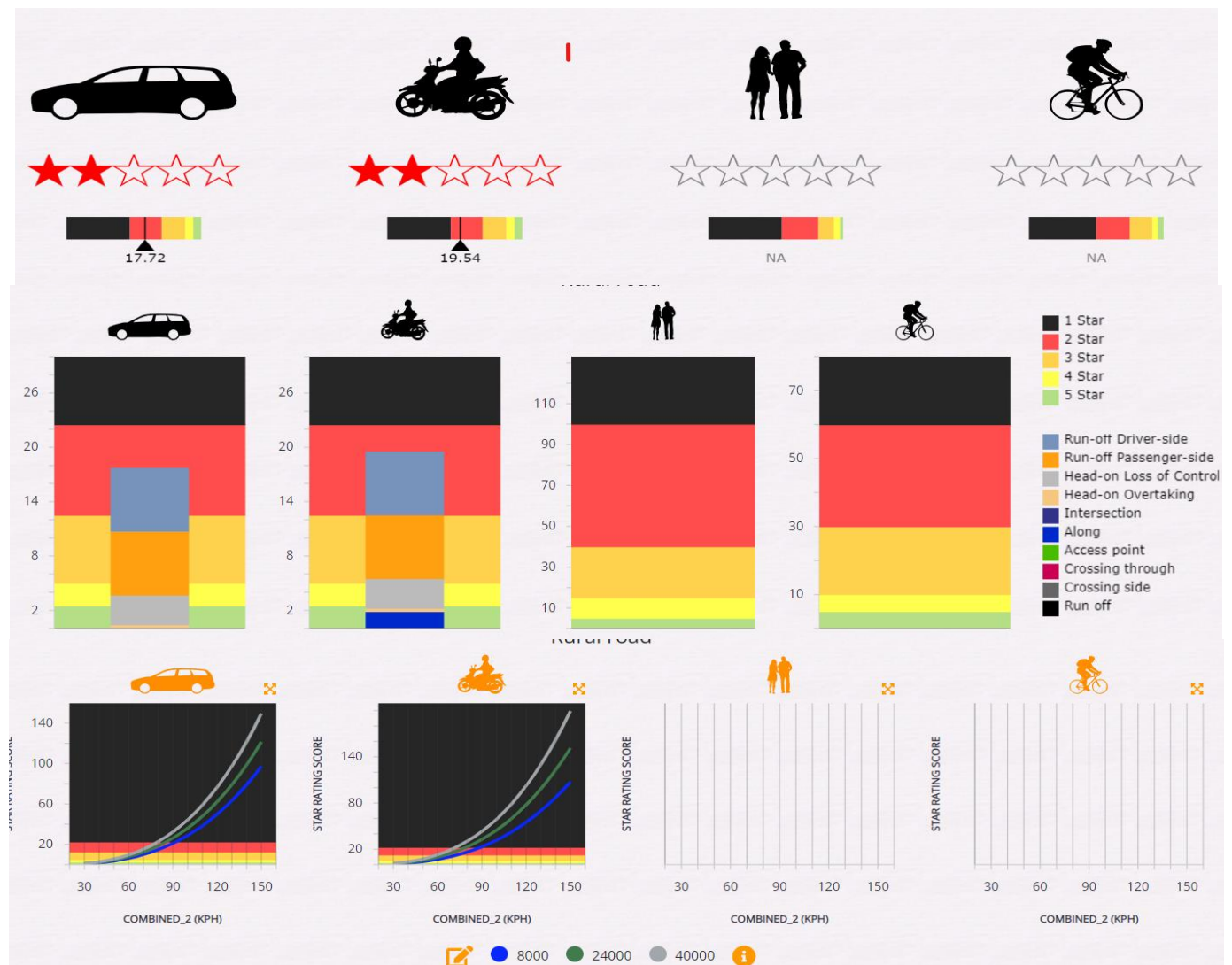


Fig 4 Star Rating Sample

From the above star rating and charts we are consider the blackspot of 4 wheelers, 2 wheelers, pedestrians, bicycles are given in table:-

Table 3 Star Ratings

Sl. No.	Name of the Black Spot	Star Rating			
		4W	2W	Ped	Bicy
1	Sadali	9.84	3.34	73.13	47.23
2	Aruru gate	2.62	3.02	25.64	7.40
3	Inimichenahalli	0.35	1.38	49.08	22.42
4	Reddygollawahalli	0.35	1.38	40.9	16.68
5	Hunegal	0.9	1.68	51.13	23.36
6	Doddapaylaburki	0.87	3.32	95.62	48.69
7	Harobande	0.87	3.32	95.62	48.69
8	Honnenahalli	0.86	2.68	93.52	36.28
9	Vapasandra flyover	5.25	8.3	157.3	57.68
10	Agalagurki flyover	3.15	7.53	157.3	57.68

V. REMEDIAL MEASURES

➤ Short Term Measures

- Provide lane marking
- Provide road studs
- Improve street lighting
- Provide zebra markings
- Install road signs
- Provide Object Hazard Marker
- Provide gore area markings
- Provide delineators
- Provide chevron signs along the curve
- Provide paved shoulders
- Provide blinkers at median openings
- Remove the unauthorized median openings

➤ Long Term Measures

- Upgradation of uncontrolled intersections to controlled intersections like signalized intersections.
- Provide Foot over bridge (FOB)
- Provide underpass
- Provide high mast lights at intersections

VI. CONCLUSION

- As per the road safety decade plan 2021-2023, all roads should meet with minimum 3 iRAP star ratings.
- After the iRAP analysis we identified that except two blackspots i.e., sadali and vapasandra flyover remaining all the blackspots are satisfied with 3 iRAP star ratings for Vehicle Occupants & Motorcyclists (4 wheelers and 2 wheelers)
- Doddapaylaburki, Harobande, Honnenahalli, Vapasandra flyover, Agalagurki flyover got single star ratings for pedestrians movements.
- Since these blackspots are not safety for pedestrians movements and so many crashes occurred related to pedestrians at these locations, therefore more concentration is required related to the road safety improvements.

- Aruru gate, Inimichenahalli, Reddygollawahalli and Hunegal spots are good for bicyclists.

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