ROAD SAFETY ASSESSMENT AND STAR RATING USING iRAP ALONG NH-48 (KADODARA-KOSAMBA) IN SURT CITY

[1]Prof.Sejal S.Bhagat, [2]Masira Mo.Arif Nalbandh

[1]Assistant Professor,Faculty of Civil Engineering,Sarvajanik College of Engineering and Technology,
[2]Student Town and Country Planning, Sarvajanik College of Engineering and Technology,
Surat,Gujarat,India

Abstract : This study has Globally, people are using roads for different purposes daily. With the usage of roads, the road encounters several problems resulting in a variety of problems for the road users. A significant point of concern is proper crashes & fatalities. India has a wide network of roads that have a variety of hierarchy and categories. Surat is one of the fastest developing cities in the world. The aim of the proposed study is to identify a road and analyze it using iRAP based parameters & methodology. The study area proposed here is the NH-48 Kadodara-Kosamba stretch of Surat where the study ranking for different aspects involved, a suitable proposal for improvement will be worked out with alternatives. Surat is a city located in the western part of India in the state of Gujarat. The paper discusses about road crashes on the selected study stretch. Also, the results of star rating obtained using iRAP methodology using tool are discussed.

IndexTerms – **iRAP,Accident crashes,Road safety,Road Assessment,VRU,Safer road investment plan.**

INTRODUCTION

The iRAP Star Ratings and Safer Roads Investment Plans (commonly referred to as a 'SRIP') are the outputs of an iRAP assessment. Star Ratings show the inherent risk of the assessed road network, while an Investment Plan guides future safety upgrades on the road network. This manual presents guidelines for creating Star Ratings and Investment Plans. Adherence to this guidance will help ensure that:

- Star Ratings and Investment Plans are prepared in a way that meets best practice.
- Poor quality and erroneous data are quickly identified so it can be rectified.
- Assessments are performed in a way that can be repeated for future assessments.
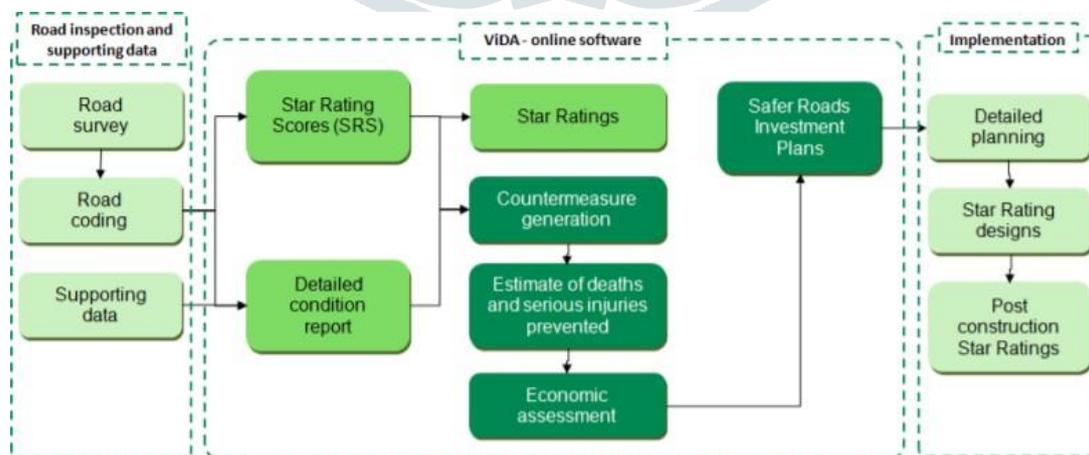
The iRAP Protocols

1. Crash Risk Mapping uses detailed crash data to illustrate the distribution of recorded fatalities and serious injuries on a road network.
2. Star Ratings provide a simple and objective measure of the level of safety provided by a road's design.
3. FSI Estimation mapping illustrates the distribution of the expected number of fatalities and serious injuries across a road network.
4. Safer Road Investment Plans (SRIP) draw on approximately 90 proven road improvement options to generate affordable and economically sound infrastructure options for saving lives.

5. Performance Tracking enables the use of Star Ratings and Crash Risk Mapping to track road safety performance and establish policy positions.

Practical Applications.

For this study Raising the standard of the world's roads to three stars or higher for all road users helps to focus policy and investment. With crash costs typically halving with each incremental improvement in star rating, 3-star or better roads have a significant potential to save lives. Many countries and project managers are now setting goals to increase the percentage of travel on three-star or better roads, as well as to establish three-, four-, or five-star standards for new and upgraded roads. The star rating is a powerful metric for specifying and tracking road safety performance at the network and project levels, much like road authorities set targets for pavement roughness or other asset performance. iRAP's methodology is being used on road infrastructure projects as a complementary measure with the road safety audit and widely accepted in India and other countries. Recent news cleared that Brazil adopted the 3 star or better roads policy throughout the country and following practice is on the verge of acceptance in other countries so that economic investment can be effectively utilized so that no low stars roads are built.

Data Input and Processing

Variables of the study contains to collect data on every aspect of the road stretch in order to analyse the star rating for the study stretch. The information is then entered into the iRAP, VIDA star rating software to obtain an accurate problem on the chosen road for the study region.The following is the iRAP method's star rating for the selected stretch.

Figure 2iRAP'S Interface to code attribute (Star Rating Demonstrator)

The conclusion drawn from the examination of the Vida star rating graph is that all road users in this area are significantly impacted, which suggests that all facilities and traffic control are required. Consequently, the rating for all Bicyclists receive a three star rating, whereas pedestrians only receive two stars. Therefore, it is imperative to provide all forms of road facilities for this stretch, including a pedestrian walk, service lane, traffic management, and road furniture.
.

Coding File (ViDA Attributes) uploaded as .csv in ViDA tool.

The purpose of road attribute coding is to record the road attributes that are visible in a geo-referenced image or road design. The coding process has four key stages—preparation, execution, review and compliance

Figure 3ROAD CODING AS PER iRAP MANUAL

Star Rating bands

Star Rating Scores are apportioned to Star Rating bands to determine the Star Rating for each 100 metre of road as shown in the table below.

Table 1STAR RATING BANDS

Star Rating	Star rating scores				
	Vehicle occupants and motorcyclists	Bicyclists	Pedestrains		
			Total	Along roadside	Crossing
5	0to<2.5	0to<5	0to<5	0to<0.2	0to<4.8
4	2.5to<5	5to<10	5to<15	0.2to<1	4.8to<14
3	5to<12.5	10to<30	15to<40	1to<7.5	14to<32.5
2	12.5to<22.5	30to<60	40to<90	7.5to<15	32.5to<75
1	22.5+	60+	90+	15+	75+

Star rating chart

For this study Star Rating charts display Star Rating results by length (in kilometres) or travel (VKT) for all four road user groups (where applicable) for the dataset(s) selected as a bar chart. The results are available as both raw (per 100m segment) or smoothed (averaged over a specified length). The results can also be displayed as before and after Star Ratings and by length or travel.
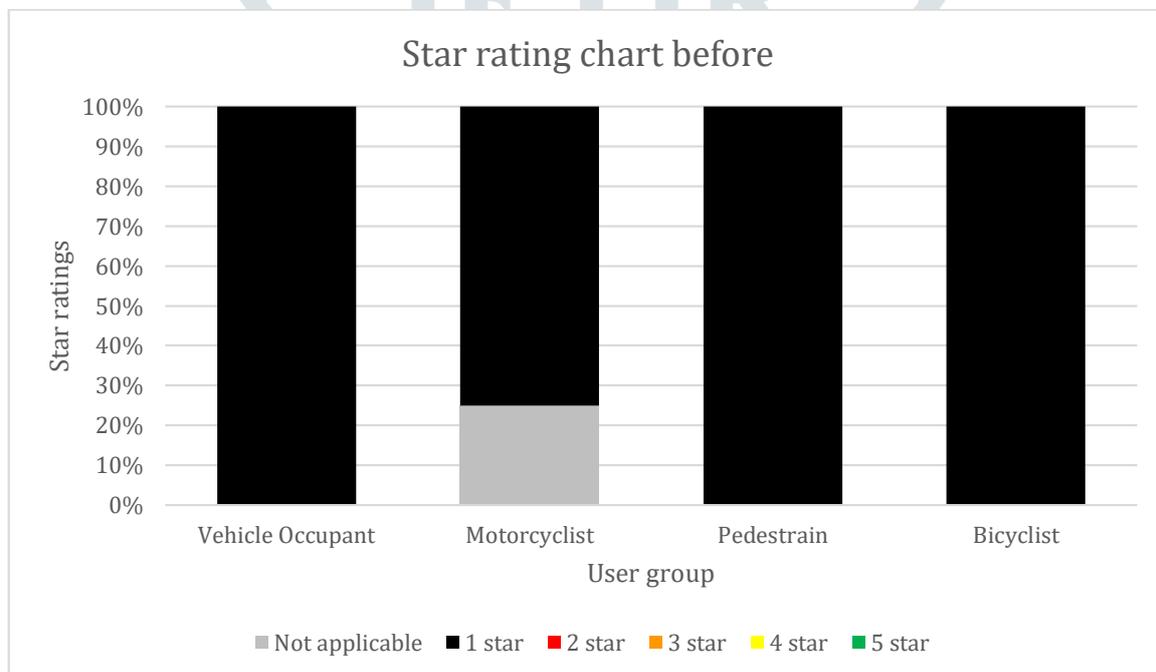
GRAPHS 1STAR RATING CHART BEFORE
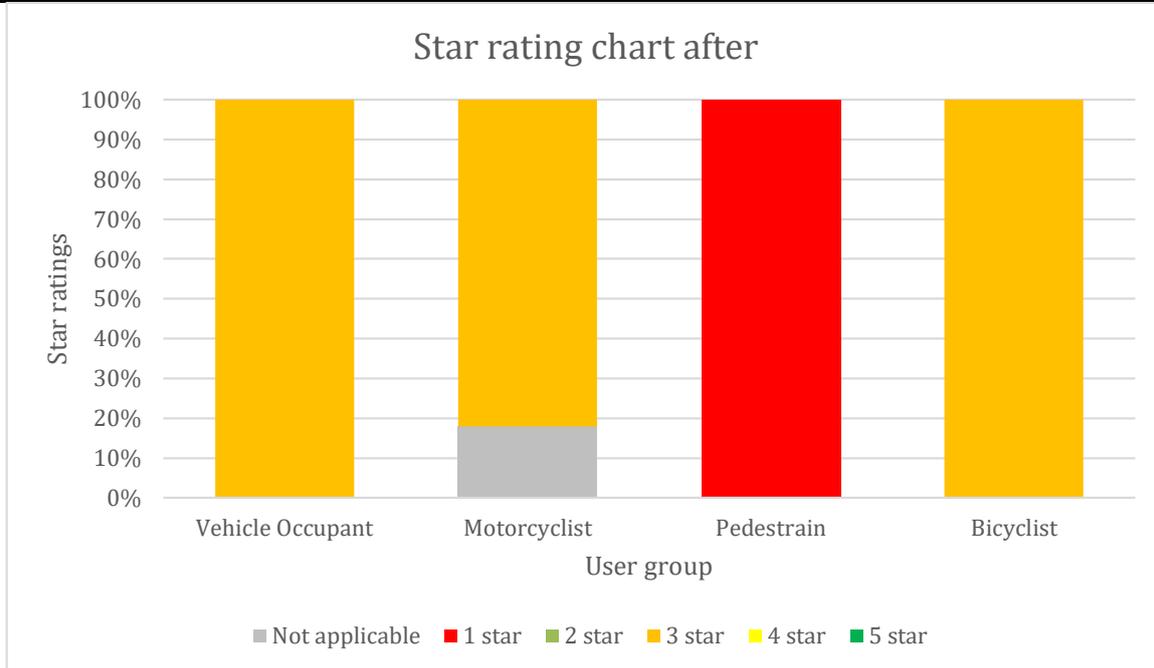
GRAPHS 2STAR RATING CHART AFTER

This graph unequivocally demonstrates that, in compared to the current condition, there has been a major improvement in the safety characteristics of the roadways. For three car occupants, motorcycle riders and cyclists, all 1-star-rated routes improved to 3-star or greater.

Fatality and Serious Injury (FSI) Estimation

       Variables of the study contains Safer Road Investment Plans assess the benefits and costs of implementing infrastructure safety countermeasures on a road. This involves making an estimate of the number of fatalities and serious injuries (FSI) that occur on each 100m segment of the existing road under existing conditions.

SECTION	VEHICLE OCCUPANT	MOTORCYCLIST	BICYCLIST	TOTAL
Phase 1_105km-Addis 2022_BCR1>Neelam hotel-Kadodara	0	0	0	0.1
Phase 1_105km-Addis 2022_BCR1>Kadodara-Umbhel	0.1	0	0	0.3
Phase 1_105km-Addis 2022_BCR1>Vav gam-Kholwad	0.1	0	0	0.2
Phase 1_105km-Addis 2022_BCR1>Choryasi-Dhoranpardi	0.3	0.1	0	1
Phase 1_105km-Addis 2022_BCR1>navi pardi-Pipodra	0.1	0	0	0.5
Phase 1_105km-Addis 2022_BCR1>Palod-Kosamba flyover	0.2	0	0	0.4
Phase 1_105km-Addis 2022_BCR1>Dhamdod-Dhamroad	0	0.3	0	0.1
Phase 1_105km-Addis 2022_BCR1>Kamrej-kadodar	0.1	0	0	0
Phase 1 105km-Addis 2022 BCR1>Kholwad-Amboli rd	0.1	0	0	0

Figure 4FSI Estimation Table (filtered by road section)

Safer Roads Investment Plan (SRIP)

Total FSIs saved	Total PV of Safety benefits	Estimated Cost	Cost per FSI Saved	Program BCR
1531	1393520899	24322977	17394	28

Countermeasure	Length/Sites	FSIs saved	PV of Safety benefit	Estimated Cost	Cost per FSI saved	Program BCR
Motorcycle Lane(Painted logos only on road)	0.20 km	9	89,82,317	72832	8363	123
Signalise intersection(4-leg)	1 sites	90	9,28,38,181	1475959	16399	63
Roadside barriers-passenger side	1.10 km	155	16,00,99,527	4389000	28277	36
Traffic calming	0.80 km	247	25,41,85,396	2065144	8373	123
Street lighting(mid-block)	1.10 km	258	26,56,55,168	5129383	19916	52
Shoulder rumble strips	1.10 km	141	14,50,27,690	180396	1283	804
Pedestrain fencing	0.30 km	48	4,93,01,643	270939	5668	182
Footpath provision driver side(informal path>1m)	1.10 km	53	5,50,30,148	3498761	65579	16
Wide centreline	0.90 km	23	2,34,01,424	86616	3818	270
Improve delineation	0.40 km	45	4,65,65,886	408170	9041	114
Footpath provision passenger side(informal path>1m)	0.50 km	40	4,16,70,217	1590346	39366	26
Signalise intersection(3-leg)	3 sites	211	21,72,78,766	2015281	9567	108
Protected turn lane (unsignalised 3 leg)	1 sites	7	71,27,566	2827281	409149	3
Sight distance (obstruction removal)	0.10 km	25	2,58,81,082	213868	8523	121
		1,351	1,39,32,50,998	24223977	17934	58

Safer Roads Investment Plan   ⊕

Figure 5SAFER ROAD INVESTMENT PLAN

Strip (SYSTEMATIC TRANSFER INVESTMENT PLAN) Table NH-48 (KADODARA-KOSAMBA)

Table 2Strip (SYSTEMATIC TRANSFER INVESTMENT PLAN) Table NH-48 (KADODARA-KOSAMBA)

Road section	Footpath Provision on driver side(informal path>1m)	Footpath Provision on passanger side(informal path>1m)	Improve delineation	Motorcycle lane	Pedestrain fencing	Protected turn lane(signalised 3 leg)	Road side barrier-passanger side	Shoulder rumble strips	Sight distance(obstruction removal)	Signalised intersection(3-leg)	Signalised intersection(4-leg)	Street lighting(mid-block)	Traffic calming	Wide centerline	total
0	●			●	●		●	●			●	●	●	●	9
0.1	●	●	●				●	●				●		●	7
0.2	●	●					●	●		●		●	●	●	8
0.3	●		●				●	●				●	●	●	7
0.4	●	●	●				●	●		●		●		●	9
0.5	●	●	●				●	●				●		●	7
0.6	●			●	●		●	●		●		●		●	9
0.7	●	●			●		●	●				●		●	7
0.8	●					●	●	●				●	●	●	7
0.9	●						●	●	●			●	●		6
1	●						●	●				●	●		5
Total	11	5	4	2	3	1	11	11	1	3	1	11	8	9	81

RESULTS AND DISCUSSION

According the graphs and the star ratings tables it is clear that the analysed road section is 100% 1 –star for vehicle occupants, pedestrians and bicyclists wheres it is about 82% unsafe or 1-star rated for pedestrians due to the land use pattern.After the implementation os the Safer Roads Investment Plans and countermeasures implementation the unsafe roads/ 1 star roads becomes rated 3-star for the 3 road user types and 2 star for the pedestrians with and investment of about Rs.24,223,977 giving the Benefit Cost Ratio as 58.The total FSI (Fatal and Serious Injuries) saved will be 1,351 in the enalysis periof od 20 years with the potential value of Rs. 1,393,250,998.3 signalised crossing at 3-legged intersections are suggested and 1 is suggested at 4-legged intersection, other countermeasures includes the widening the centerline and improving delineation , traffic calming , shoulder rumble strips etc..

CONCLUSION

The results of the iRAP Road Safety Evaluation for the NH-48 (Kadodara-Kosamba) Section provided new insights into the highway safety in terms of the infrastructure along the sides of the roadways as well as new avenues for research. When evaluating the condition of the road sections and making recommendations The practise of assigning stars to changes turned out to be effective. The objectives have been successfully met. In order to obtain potential star scores in the routes, it also established the proper confidence values demonstrating that the coders are comfortable with the iRAP approach.

REFERENCES

- Valizadeh N, Holasou H A, Mohammadi S A and Khawar K M 2021 A Comparison of Genomic DNA Extraction Protocols in Artemisia annua L. for Large Scale Genetic Analyses Studies Iran. J. Sci. Technol. Trans. A Sci. 45 1587–95
- Cruz L M, Kwon J Y, Oman S P, Zaver H, Bolaños G A, Kröner P T, Raimondo M, Bi Y, Lukens F J and Corral J E 2021 Comparison of idiopathic recurrent acute pancreatitis [IRAP] and recurrent acute pancreatitis with genetic mutations Dig. Liver Dis. 53 1294–300
- Domínguez-Vías G, Segarra A B, Ramírez-Sánchez M and Prieto I 2021 Effects of virgin olive oil on blood pressure and renal aminopeptidase activities in male wistar rats Int. J. Mol. Sci. 22
- Nasri F, Zakizadeh H, Vafaee Y and Mozafari A A 2021 In vitro mutagenesis of Chrysanthemum morifolium cultivars using ethylmethanesulphonate (EMS) and mutation assessment by ISSR and IRAP markers Plant Cell. Tissue Organ Cult.
- Staton M, Barnes J, Morris A and Waterson P 2021 'Over to you': using a STAMP control structure analysis to probe deeper into the control of UK road safety at a municipal level–the case of Cambridgeshire Ergonomics
- ezende M C, Bast D F, Huziwara E M and Bortoloti R 2021 The Implicit Relational Assessment Procedure as a Measure of Hopelessness in the Elderly: An Exploratory Study Psychol. Rec. 71 313–7