Road Management Best Practices

Integrating Road Safety and Asset Management

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iRAP

www.irap.org

A world free of high risk roads
THE GLOBAL CHALLENGE

THE COST OF INACTION IS UNACCEPTABLE.

Road crashes are mostly **predictable and preventable** and the benefits of action and a world free of high-risk roads is high.

We have the **vaccines for roads**.

Now is the time to save lives on a scale that matters as part of an integrated safe system approach.

EACH DAY

3,500
people are killed in road crashes

A HIDDEN REALITY FOR THE WORLD

100,000
suffer life-changing injuries daily

15,000,000
Will die between now and 2030

500,000,000
Will be injured between now and 2030

US$24 trillion
in crash costs to the community up to 2030

Road Asset Management

- *Looking after the highways network is a **national priority** given its fundamental role in the economy. To fulfil this potential, it needs to be **adequately maintained**.*

- The aim is to provide a **structured approach** to roads maintenance to enable highway authorities to **operate, maintain** and **restore** their 'highway assets' to meet ***key performance requirements***

- The asset management approach looks at all transport issues collectively with a long-term view, which allows highway authorities to consider what the alternative options are, set performance targets and assess the results. In this way, they are able to support their funding requests with hard facts.

- This allows further improvement of the service to be targeted and the timing of maintenance to be planned such that further deterioration is minimised.

EFFECTIVE National Road Network

Safe, ***Efficient*** and ***Well-developed*** national roads network

- A systematic approach for coordinating maintenance programs with road safety improvement is vital for ensuring an effective road transport system
- Ensuring roads are safe is an important objective of the overall asset management systems
- The results from a number of road crash investigations and statistical analyses have concluded that collisions are a result of the interaction of four key elements
    - Human Error
    - Unsafe vehicles
    - Poor road Infrastructure
    - High Speeds

Safe System

Interaction between road users, vehicles, road infrastructure and speed….

- Aims to develop a road transport system that is better able to accommodate human error
- Acknowledges that crashes will happen
- Takes into account the vulnerability of the human body
- Mistakes made on the highway need not have fatal and serious outcomes
- System relies on multi-disciplined approach

Within the framework of asset management, it is very difficult to model driver behavior or vehicle quality. Therefore incorporating safety into asset management is somewhat restricted to the road factors.

Integration of Safety and Asset Management

- The detailed management and modelling of road assets and its associated investment appraisal is well advanced and **many may consider road safety aspects by coincidence**. However, this is not enough considering the carnage of road crashes. A **more explicit road safety management approach would add value.**

- The iRAP Methodology is widely considered as the world standard for **crash and injury reduction appraisal** as it is associated with the work of organisations like PIARC, various Development and Investment Banks and road safety experts. iRAP provides a **powerful road assessment tool** delivering cost effective recommendations, enabling prioritization of safety interventions based on specific budgets, supporting project appraisal and promoting life saving outcomes.

- iRAP and Asset Management systems can be **readily integrated** leading to **enhanced outcomes of any road management strategy** to maximize benefits to road users and stakeholders.

About iRAP:

Registered charity

Vision: a world free of high risk roads

Inspect high-risk roads and develop Star Ratings and Safer Roads Investment Plans

80+ countries, 1 million km +

Programme donors

Project, development and technical partners

Centres of Excellence and Global Technical Committee (GTC)

Self-governing programmes

Lead Partners – SR4S

UN Road Safety Targets to support SDGs

TARGET 1 2020

Target 1: By 2020, all countries establish a comprehensive multisectoral national road safety action plan with time-bound targets.

TARGET 2 2030

Target 2: By 2030, all countries accede to one or more of the core road safety-related UN legal instruments.

TARGET 3 2030

Target 3: By 2030, all new roads achieve technical standards for all road users that take into account road safety, or meet a three star rating or better.

TARGET 4 2030 75%

Target 4: By 2030, more than 75% of travel on existing roads is on roads that meet technical standards for all road users that take into account road safety.

TARGET 5 2030 100%

Target 5: By 2030, 100% of new (defined as produced, sold or imported) and used vehicles meet high quality safety standards, such as the recommended priority UN Regulations, Global Technical Regulations, or equivalent recognized national performance requirements.

TARGET 6 2030 50%

Target 6: By 2030, halve the proportion of vehicles travelling over the posted speed limit and achieve a reduction in speed-related injuries and fatalities.

TARGET 7 2030 100%

Target 7: By 2030, increase the proportion of motorcycle riders correctly using standard helmets to close to 100%.

TARGET 8 2030 100%

Target 8: By 2030, increase the proportion of motor vehicle occupants using safety belts or standard child restraint systems to close to 100%.

TARGET 9 2030 50%

Target 9: By 2030, halve the number of road traffic injuries and fatalities related to drivers using alcohol, and/or achieve a reduction in those related to other psychoactive substances.

TARGET 10 2030

Target 10: By 2030, all countries have national laws to restrict or prohibit the use of mobile phones while driving.

TARGET 11 2030

Target 11: By 2030, all countries to enact regulation for driving time and rest periods for professional drivers, and/or accede to international/regional regulation in this area.

TARGET 12 2030

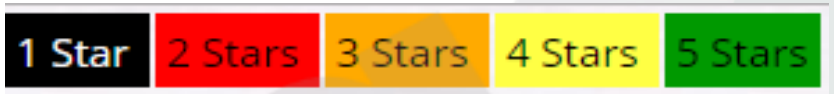
Target 12: By 2030, all countries establish and achieve national targets in order to minimize the time interval between road traffic crash and the provision of first professional emergency care.

http://www.who.int/violence_injury_prevention/road_traffic/12GlobalRoadSafetyTargets.pdf?ua=1

What is an iRAP Assessment

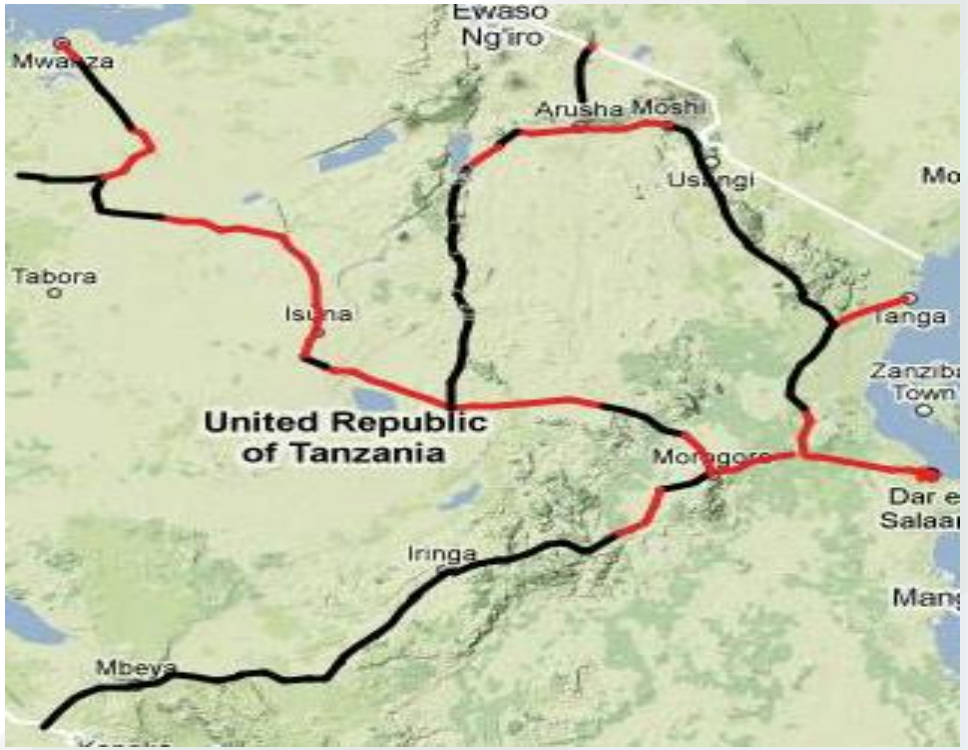
An assessment of the infrastructure leading to Star Ratings that provide a simple and objective measure of the level of safety which is ‘built-in’ to the road infrastructure for each road user group namely vehicle occupants, motorcyclists, bicyclists and pedestrians.

Five-star roads are the safest while one-star roads are the least safe. The Star Ratings ensures better understanding and awareness of why some roads are safer than others



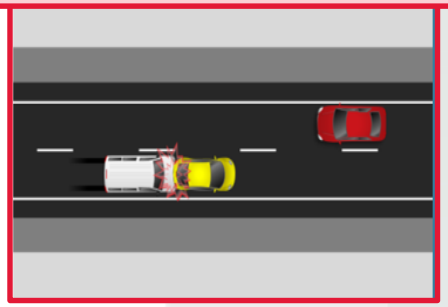
The iRAP Methodology considers the existing Infrastructure or Proposed designs and assesses the risks road users are exposed to. Armed with the cost of countermeasures and the Value of Life information, the iRAP model determines cost effective counter-measures to improve the safety rating of the infrastructure.

Road infrastructure developers are then able to design and implement cost effective countermeasures to enhance safety on the road, set minimum safety levels for each road user type and use Star Ratings as a performance indicator to demonstrate reduction in risk

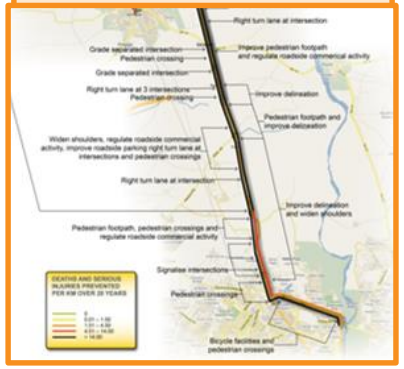


iRAP Tools

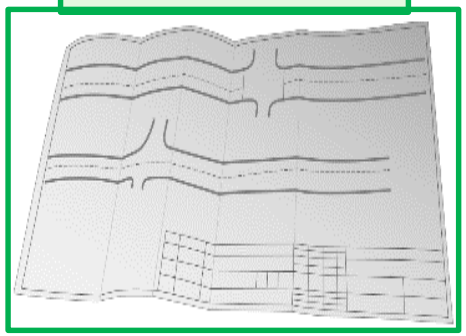
Shunt Crash Modelling



Investment Plans (UDIP)



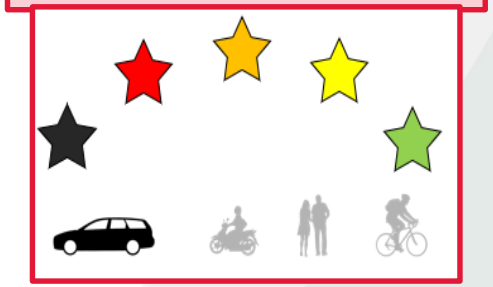
Star Rating for Designs (SR4D)



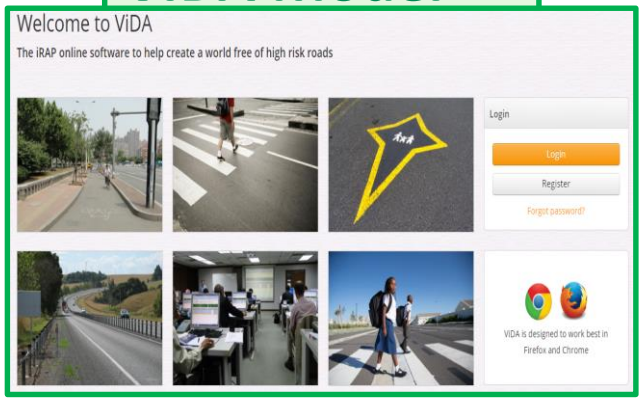
Safer Roads Investment Plans (SRIP)

Risk Assessment

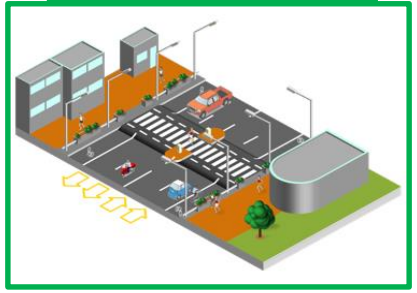
Light Star Rating



VIDA Model



Demonstrator

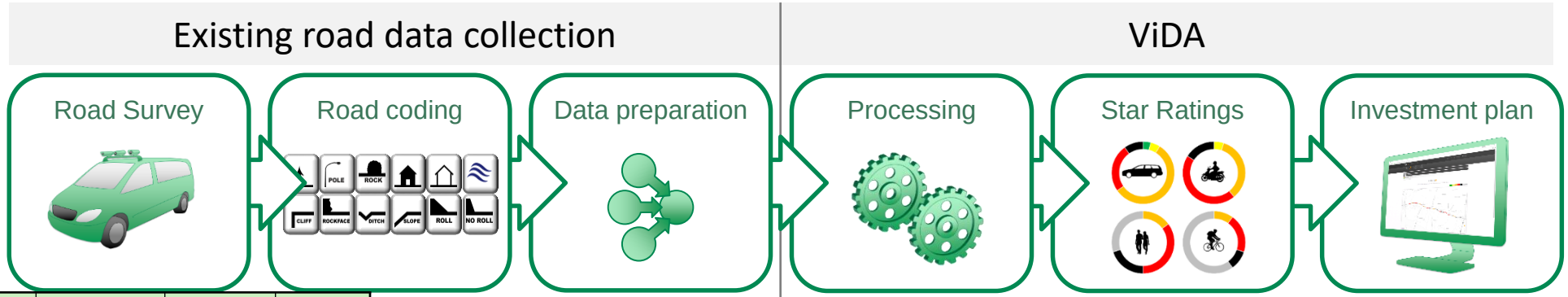


Star Rating for Schools (SR4S)

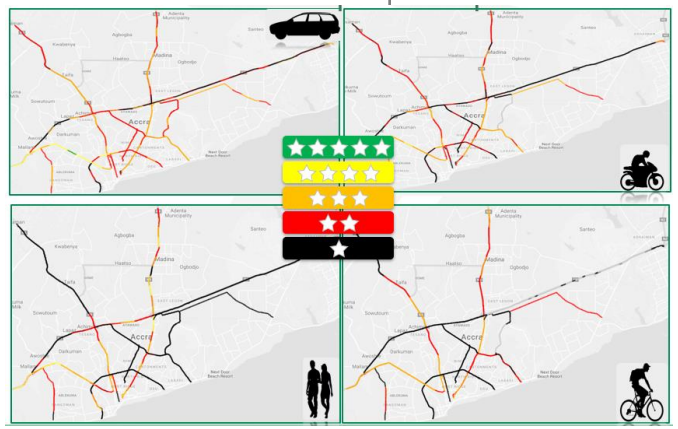
UrbanRAP models

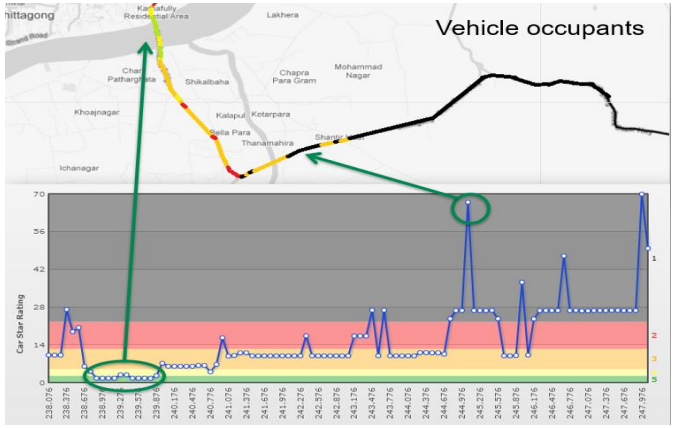
CycleRAP, Pedestrian, Intersections

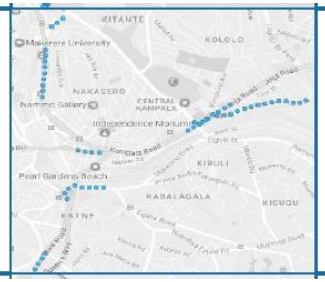
Star Rating Process



Star Rating	Vehicle occupants		Motorcyclists		Pedestrians		Bicyclists	
	km	%	km	%	km	%	km	%
5	1	0%	0	0%	0	0%	0	0%
4	20	8%	5	2%	17	6%	0	0%
3	100	38%	72	28%	41	16%	53	20%
2	102	39%	82	31%	50	19%	62	24%
1	38	15%	92	35%	153	59%	106	41%
Not applicable	0	0%	10	4%	0	0%	40	15%
Total	261	100%	261	100%	261	100%	261	100%





Central median barrier		Some central medians have been installed along the newly rehabilitated road sections. Beautification exercises along the main roads in Kampala city have also seen central islands becoming more effective as pedestrian refuges.

Survey

A road asset database can be a source of survey video for iRAP assessments. Data collection methodology and process for asset management is adequate for an iRAP assessment.

Images captured using a GPS enabled camera with capability for wide and / or multiple imagery.

Geo-referencing data attained including distance along road at 100m intervals as well as speed, elevation and grade.

Ability to collect road roughness (IRI), rutting & surface texture data

Ability to automatically calculate Grade and curvature desirable.

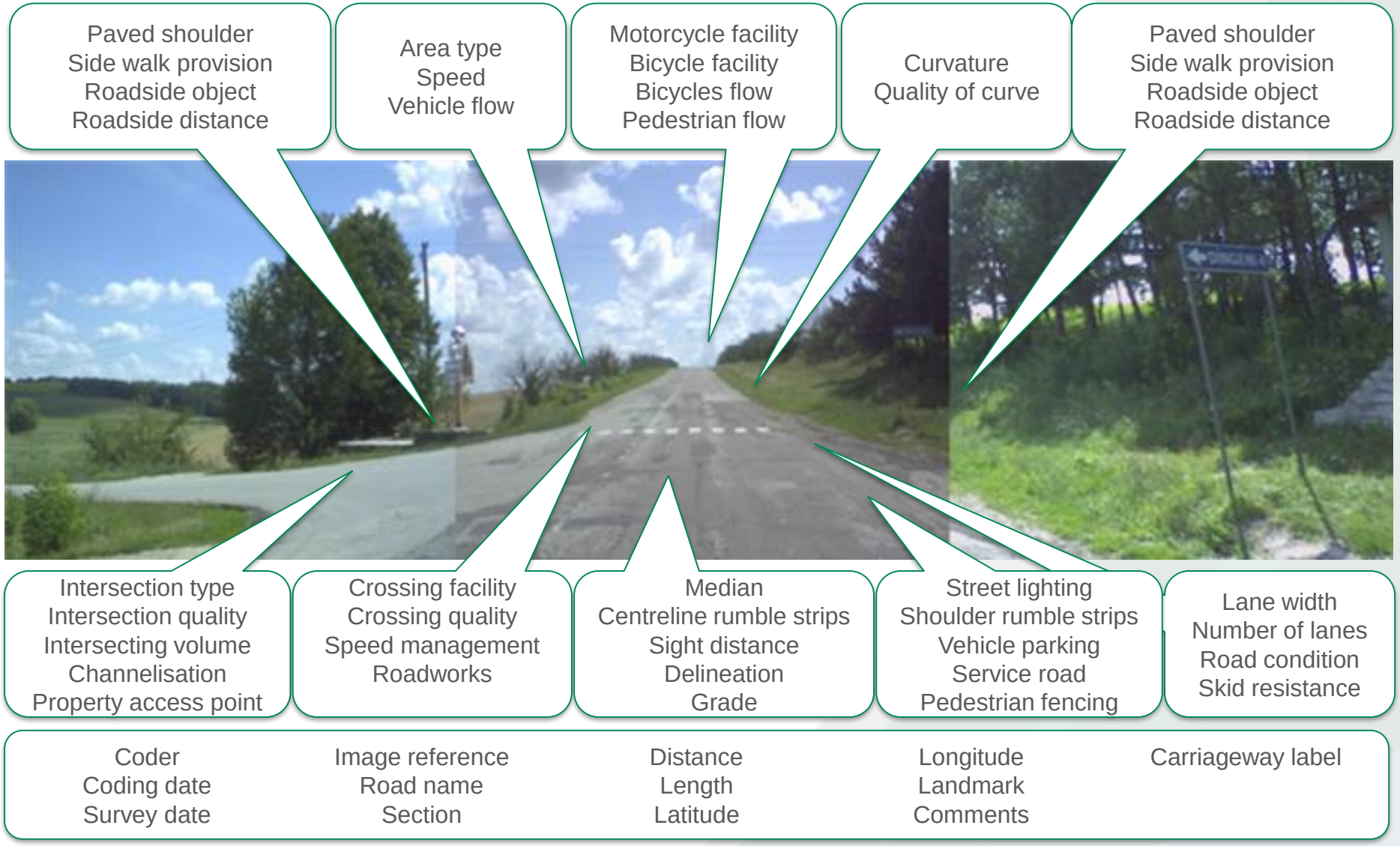
Attributes Recording

iRAP assessments involve recording more than

- **50 infrastructure elements** for each
- **100m segment** of the network.

These attributes have a proven influence on the likelihood and / or severity of a crash.

A road asset database can be a source of coding data for iRAP assessments. Eg records on lane widths, safety barrier locations, pavement condition, etc

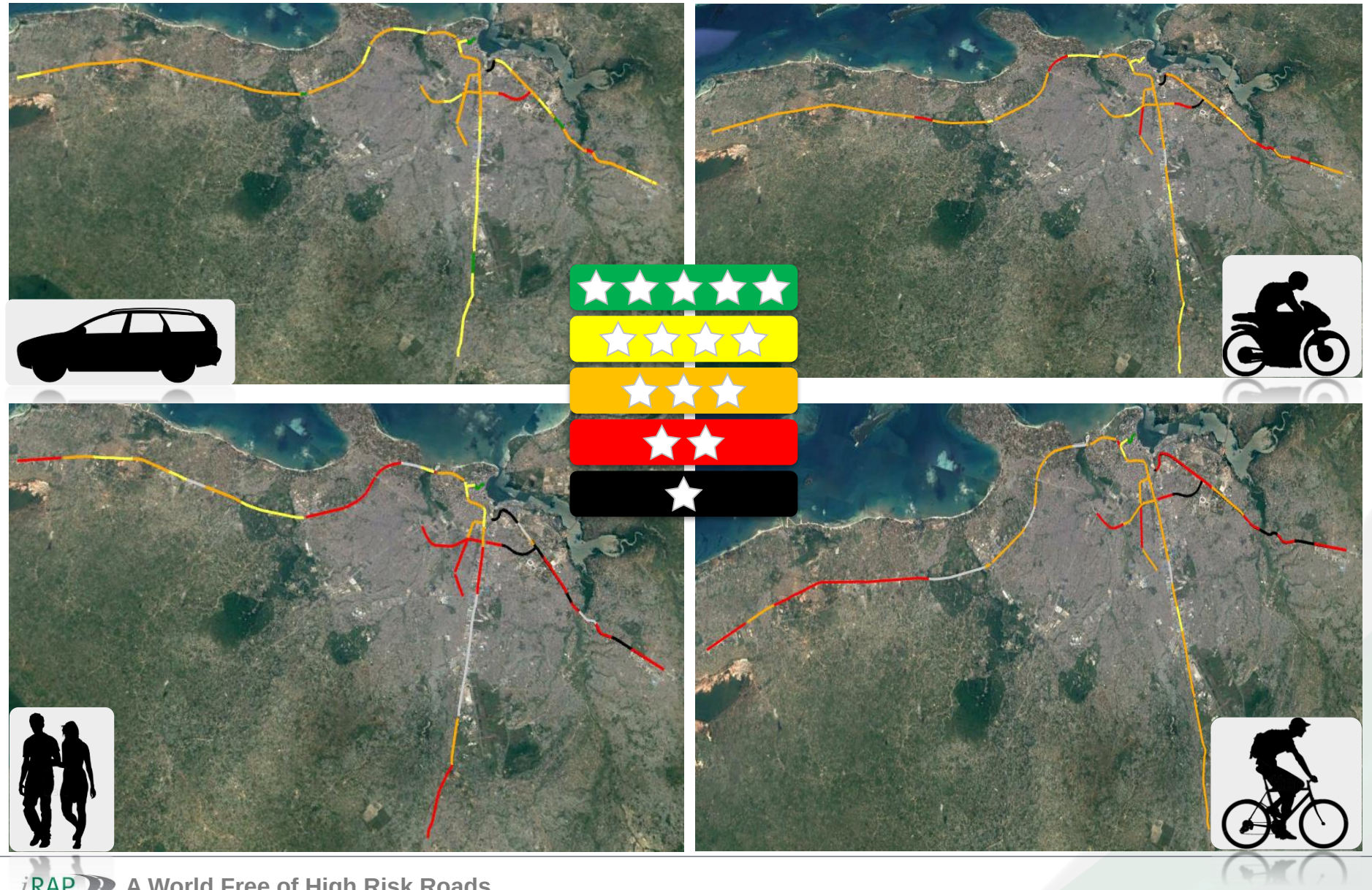


Results: Baseline Star Rating Tables

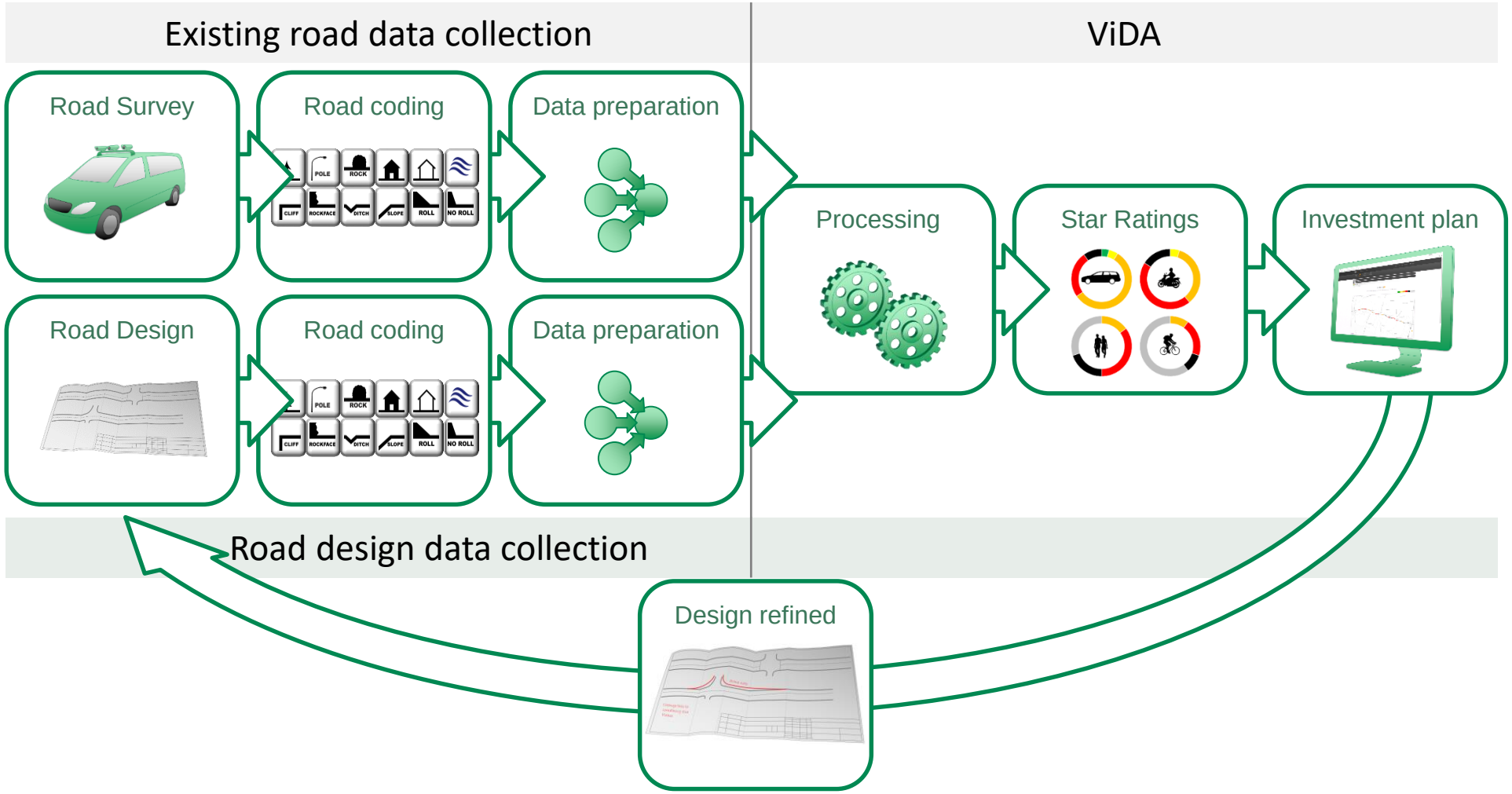
Star Rating	Vehicle occupants		Motorcyclists		Pedestrians		Bicyclists	
	km	%	km	%	km	%	km	%
5	4	3%	0	0%	1	1%	1	1%
4	29	25%	14	12%	18	15%	4	3%
3	71	62%	74	64%	23	20%	52	45%
2	8	7%	18	16%	41	36%	36	32%
1	3	3%	9	8%	32	28%	22	19%
Not applicable	0	0%	0	0%	0	0%	0	0%
Total	115	100%	115	100%	115	100%	115	100%

- Of the 115km assessed in the baseline scenario;
  - 90% of the road is rated 3-stars or better for vehicle occupants.
  - 76% of the road is rated 3-stars or better for motorcyclists.
  - 49% of the road is rated 3-stars or better for bicyclists.
  - 36% of the road is rated 3-stars or better for pedestrians.

Results: Baseline Star Rating Map



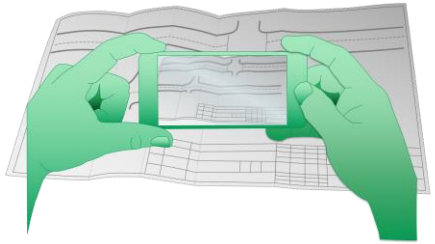
Star Rating for Designs (SR4D) - Process



SR4D web app overview

1. Design plan

2a. Capture images



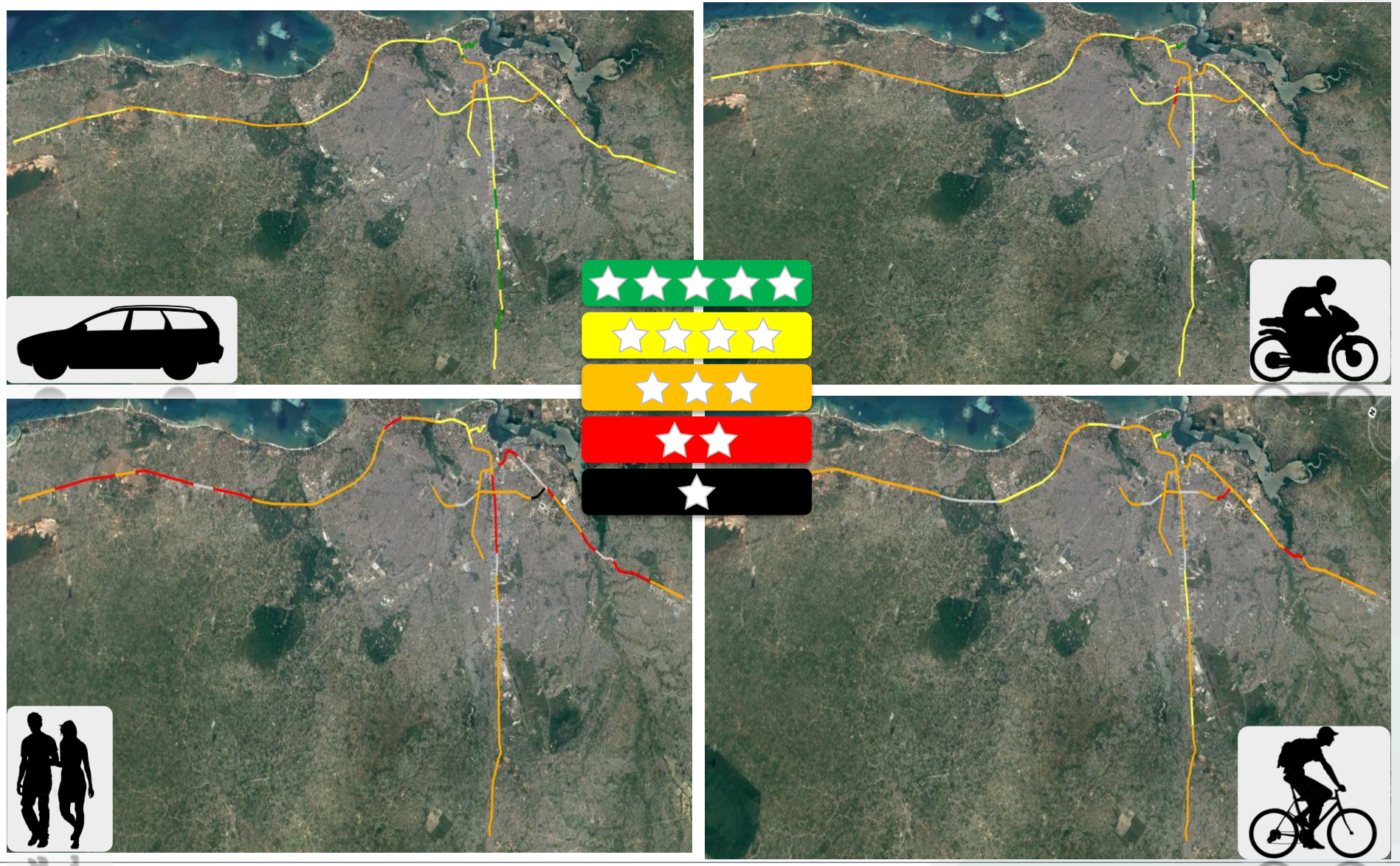
PNG / JPG

2b. Import designs

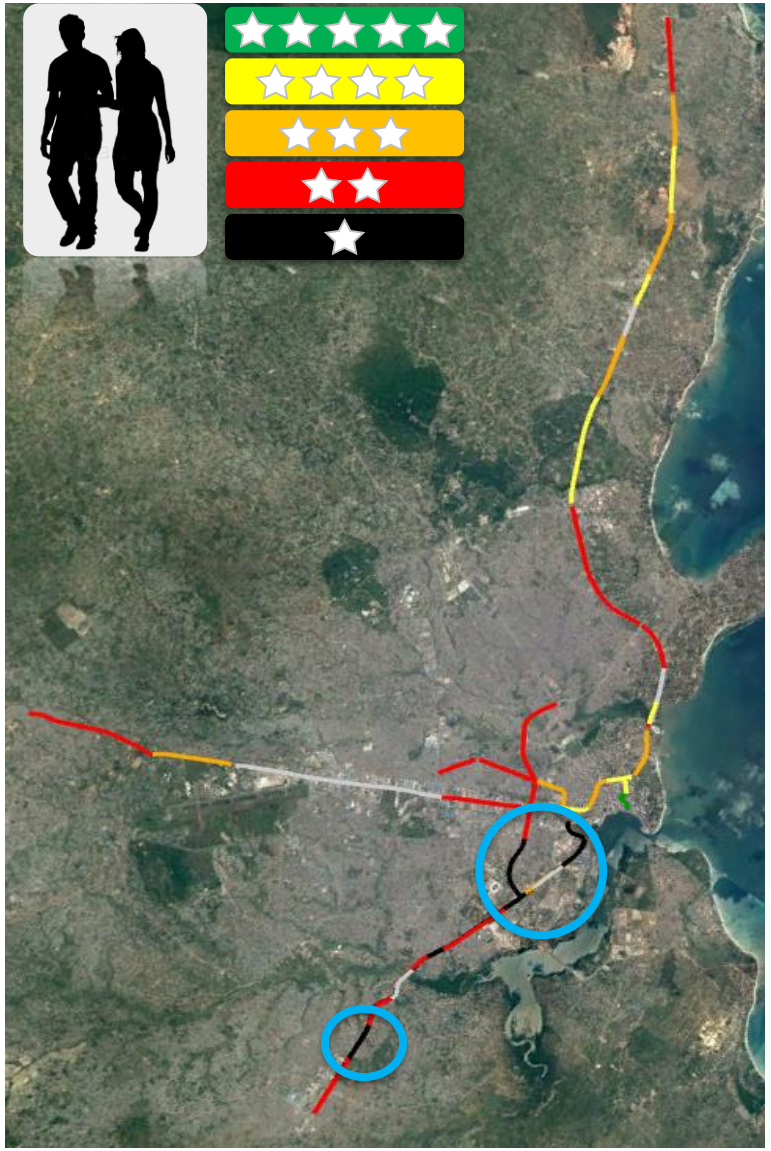
3. Code features

4. Star Ratings

Results: Star Rating for Design (SR4D) Maps

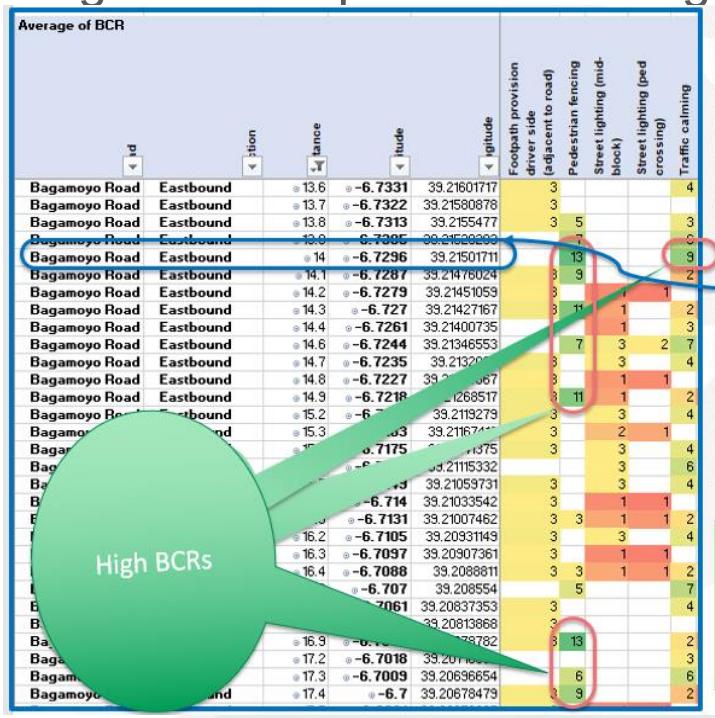


Results: Pedestrian Star Rating Map



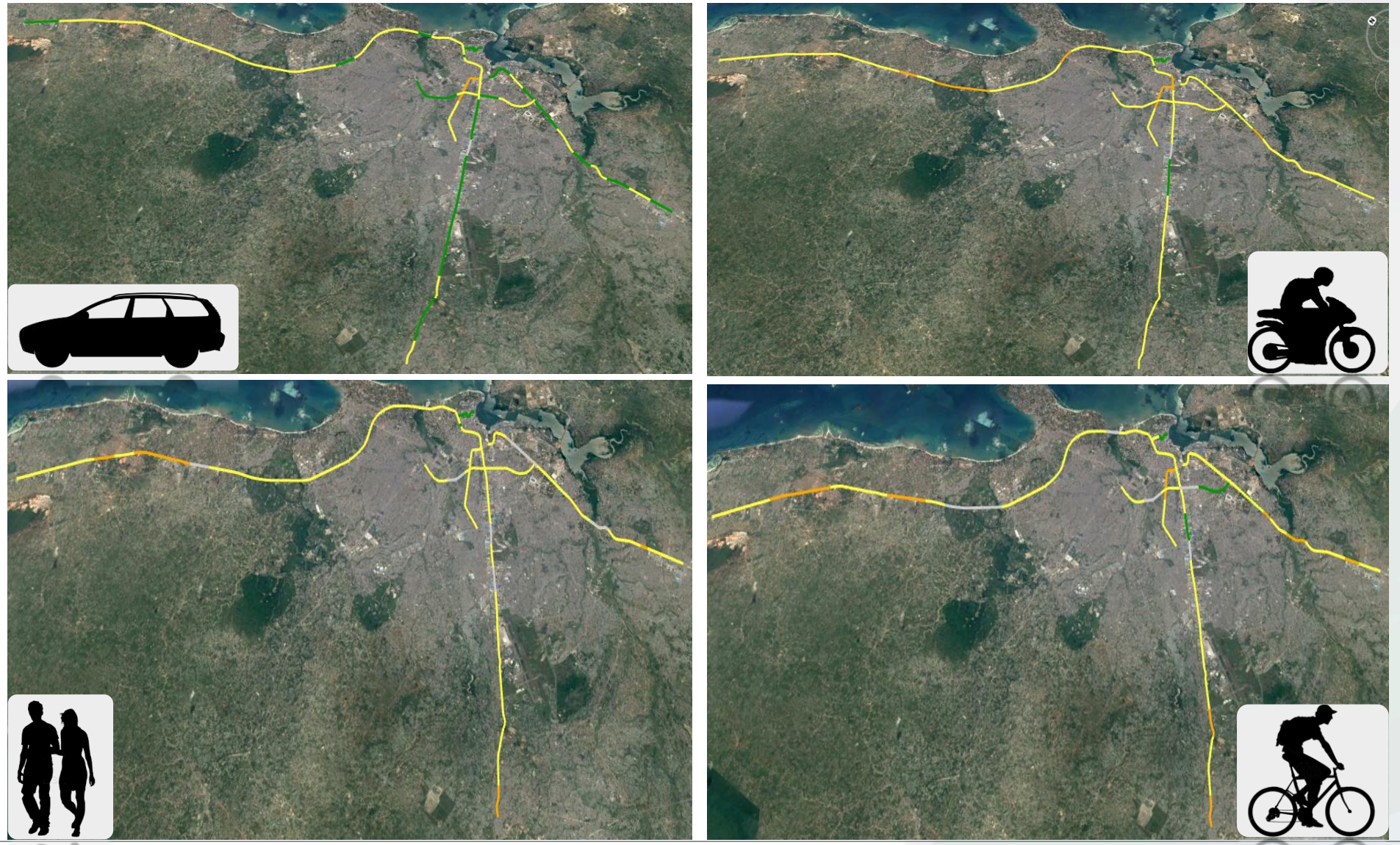
With a base star rating of a road network

- Maintain you least safe roads the most frequently
- Set maintenance intervention levels and response times linked to Star Rating.
- For more expensive data collection like skid resistance / roughness / rutting it can be prioritized using the star rating / fatality estimate data from RAP



Countermeasure Costs (Urban, High upgrade costs) TZS 20yrs	
Footpath provision driver side	172,271,328
Pedestrian fencing	50,511,111
Street lighting (mid-block)	89,397,908
Traffic calming	84,535,143

Results: Recommendations Star Rating Maps (SRIP)



Star Rating Targets for Designs – India example

% 3 Star or greater achieved

	Existing	Initial design	Final design
	14%	87%	98%
	5%	52%	56%
	0%	60%	88%
	0%	47%	55%

Star Rating for Schools (SR4S)

Star Rating for Schools (SR4S) is an

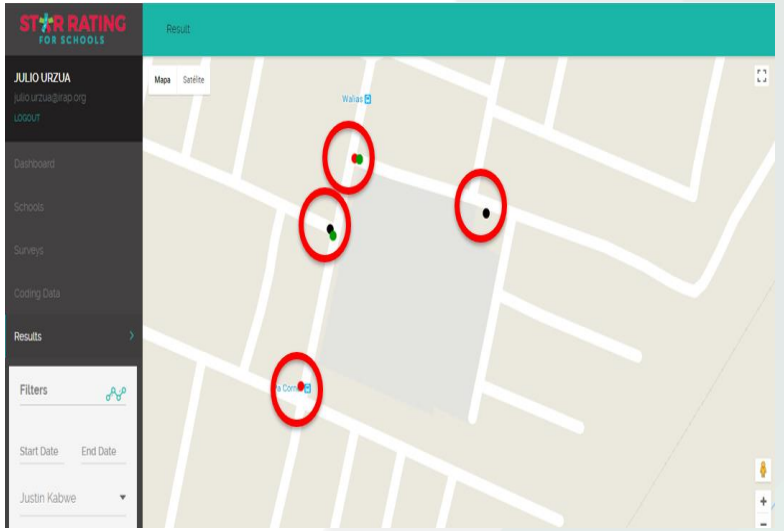
- easy to use;
- Objective; and
- evidence based tool

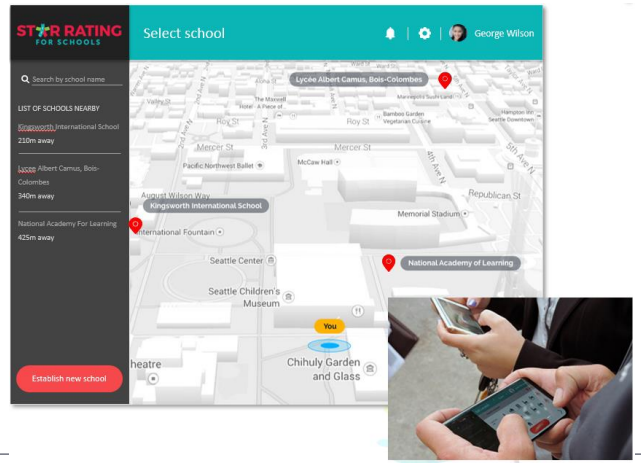
For

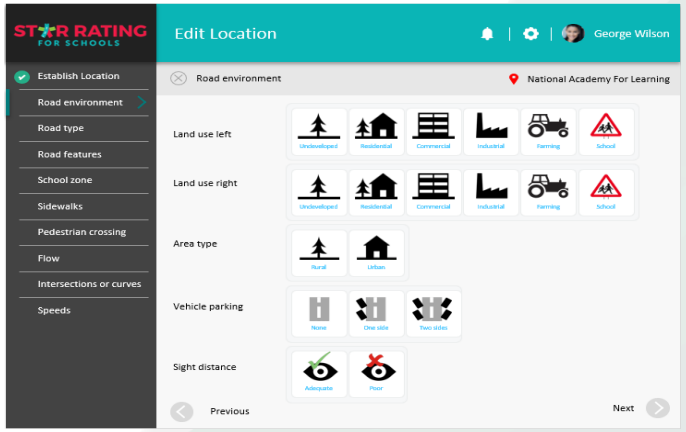
- Measuring;
- Managing; and
- communicating

the risk children are exposed to on school journeys

Star Rating for Schools - Process







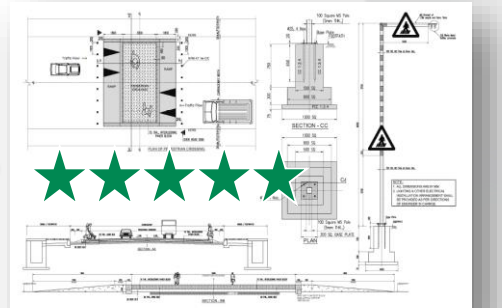
Improvement of Star Ratings

COUNTERMEASURE	Current situation	Proposal 1	Proposal 2	Proposal 3	Proposal 4	Proposal 5
Paved Shoulder driver side	Not Present	**Present**	Present	Present	Present	Present
Paved Shoulder passenger side	Not Present	**Present**	Present	Present	Present	Present
Traffic calming	Not Present	Not Present	**Present**	Present	Present	Present
Operating speed	45km/h	45km/h	**35km/h**	35km/h	35km/h	35km/h
Delineation	Poor	Poor	Poor	**Adequate**	Adequate	Adequate
Center rumble strips	Not Present	Not Present	Not Present	**Present**	Present	Present
Pedestrian fencing	Not Present	Not Present	Not Present	**Present**	Present	Present
Pedestrian crossing facility	No facility	No facility	No facility	No facility	**Refuge only**	Refuge only
Side walk passenger side	Informal path	Informal path	Informal path	Informal path	Informal path	**Physical barrier**
Side walk driver side	None	None	None	None	None	**Physical barrier**
STAR RATING	★★	★★	★★★	★★★	★★★	★★★★
Star Rating Score	**75.38**	**66.62**	**33.31**	**30.24**	**15.33**	**9.08**

The iRAP Project Cycle Vs Typical Asset Management Project Cycle

Road Survey
Geo-reference video data of the road collected

Implementation
Recommendations built into road designs and projects



Design Stars

Attribute coding Infrastructure features that influence road user risk recorded

Detail the condition and status of infrastructure

Star Ratings: level of safety built into the infrastructure

Standard Vs Reality: Determining status and prioritising actions

Priority quality Countermeasures simple, effective affordable improvements

Integrating Asset Management with iRAP

- Data collection methodology and process for asset management is adequate for an iRAP assessment
- Attribute coding to record the elements of the road environment that influence the probability / severity of a crash
- VIDA is a free online software to get a star rating.
- Incorporate your star rating maps with your asset management plan to determine where the high risk areas are and to help prioritize your works plan.
- Outputs of iRAP assessments can be integrated into asset databases. Eg:
  - The coding can become part of the asset management database.
  - The risk scores can become part of the asset management database.
- Outputs of iRAP assessments can be rolled into asset maintenance and upgrade programs.

Best Practice Asset Management Applications

TRADITIONAL RAMS

CONSERVING THE INITIAL CONDITIONS OF THE ROAD SAFETY BENEFITS UNINTENDED

MAINTENANCE OF ROADS

BEST PRACTICE RAMS

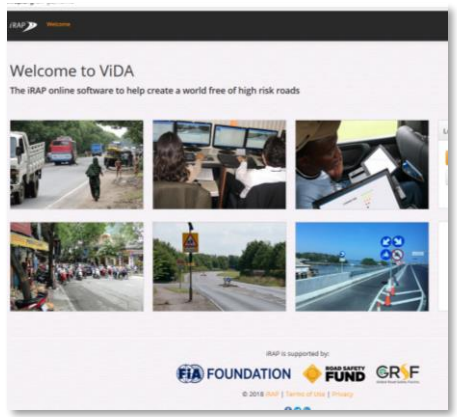
CONTINUOUS IMPROVEMENT AND **MODERNIZATION** OF THE EXISTING NETWORK SAFETY AN **UPFRONT CONSIDERATION**

MANAGEMENT OF THE ROADS

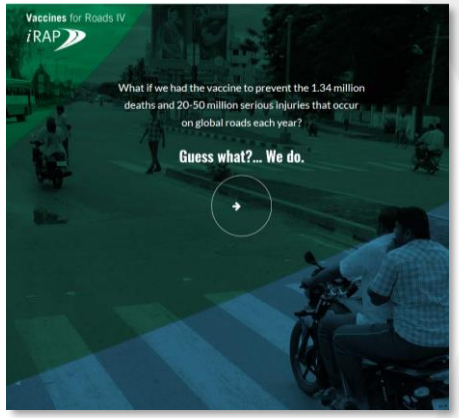
STANDARDIZATION OF THE IMPROVEMENTS

Resources and more information

iRAP website
http://www.irap.org



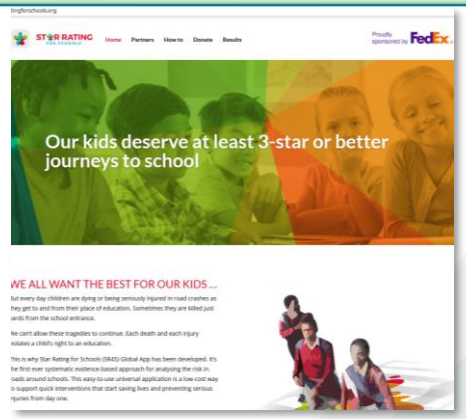
ViDA online software
http://vida.irap.org



Vaccines for Roads
http://vaccinesforroads.org

"There is no management without assessment"

Road Safety Toolkit
http://toolkit.irap.org



Star Ratings for Schools
http://starratingsforschools.org

John Dawson. Board Member & Founding Member of EuroRAP in 1999

For more information

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