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Star Rating of Roads
View Point of a Road Safety Consultant

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with the support of Mr Greg Smith, Asia-Pacific Regional Director ***iRAP***

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iRAP Star Ratings

Star Rating is developed by **iRAP** (International Road Assessment Programme), a charity dedicated to **"A world free of high risk Roads"**

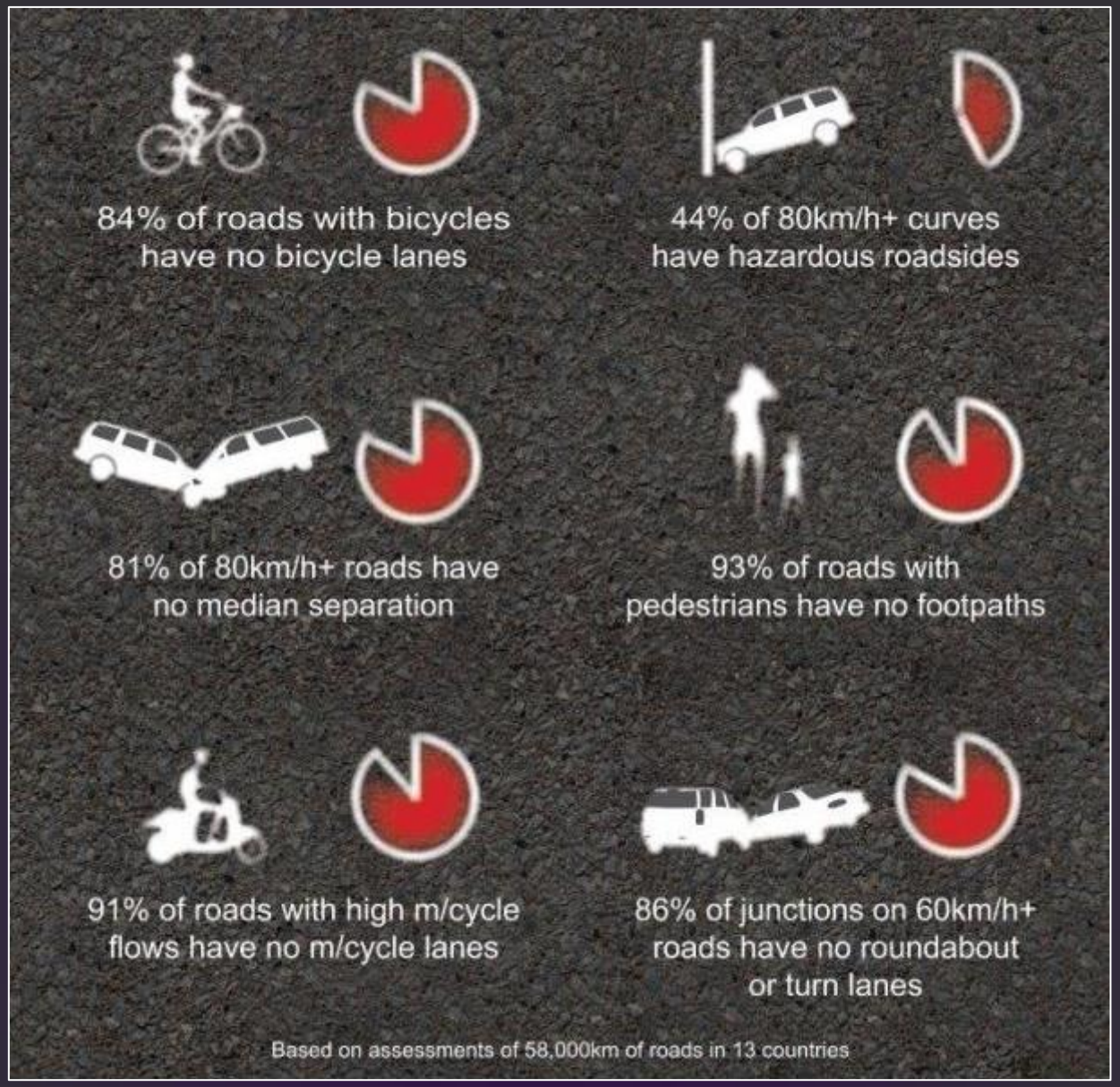
Star Ratings are based on road inspection data and provide a simple and objective measure of the level of safety which is 'built-in' to the road for vehicle occupants, motorcyclists, bicyclists and pedestrians.

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

Star Ratings can be completed without reference to detailed crash data, which may be lacking.

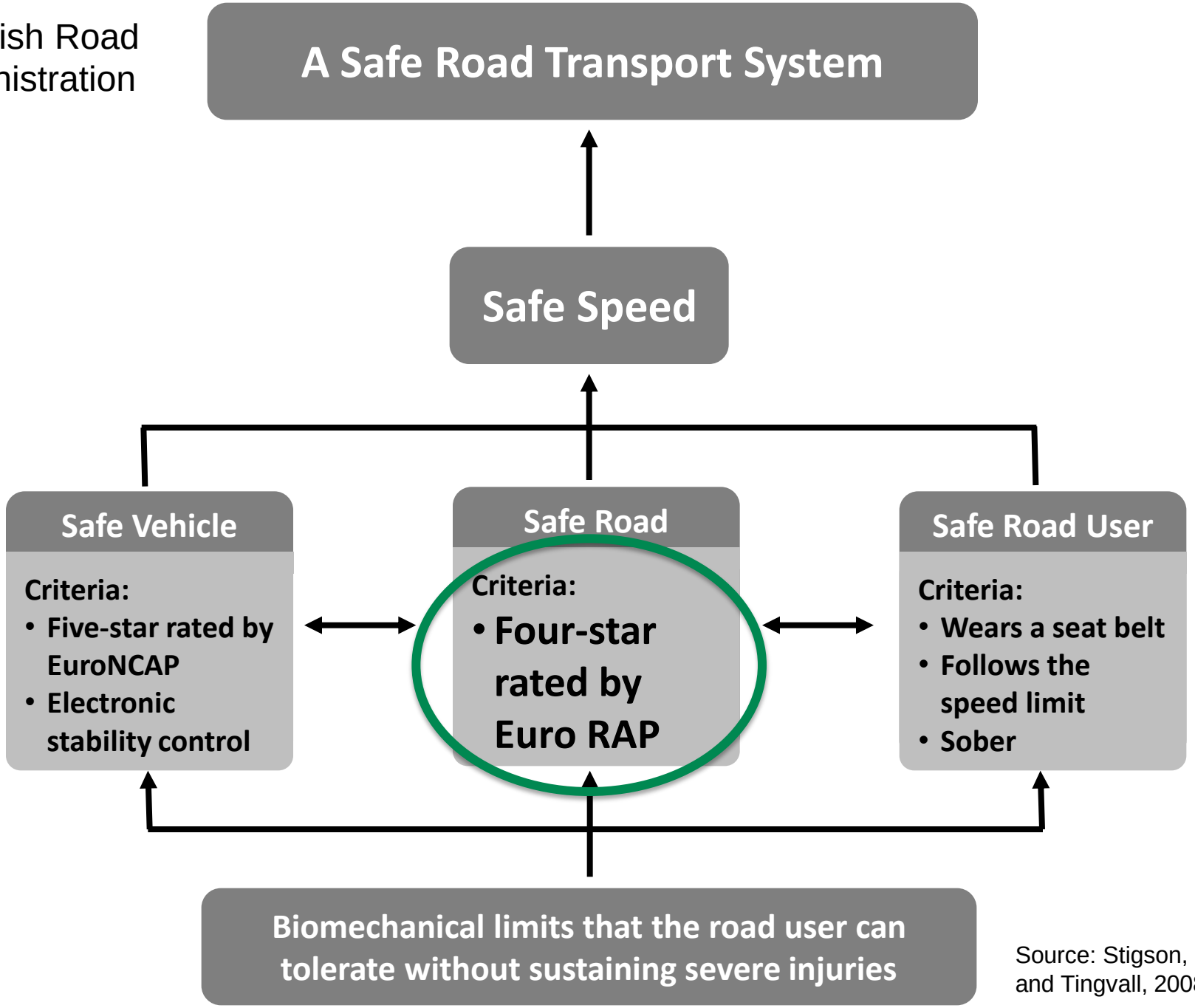
source : iRAP

Known Risks and Known Solutions



source : iRAP

Swedish Road Administration



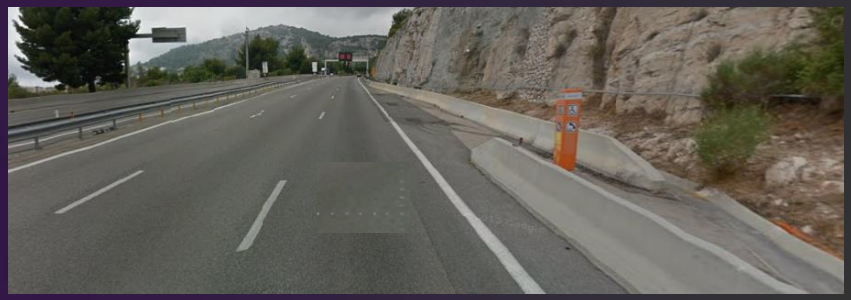
Source: Stigson, Krafft and Tingvall, 2008

source : iRAP

Features contributing to Low Star Rating

Features contributing to High Star Rating

Features contributing to High Star Rating



Basis of the iRAP model structure

The basis of the iRAP model is applying risk factors to road data to calculate a **Star Rating Score** (SRS). The SRS are used to determine the **Star Rating**.

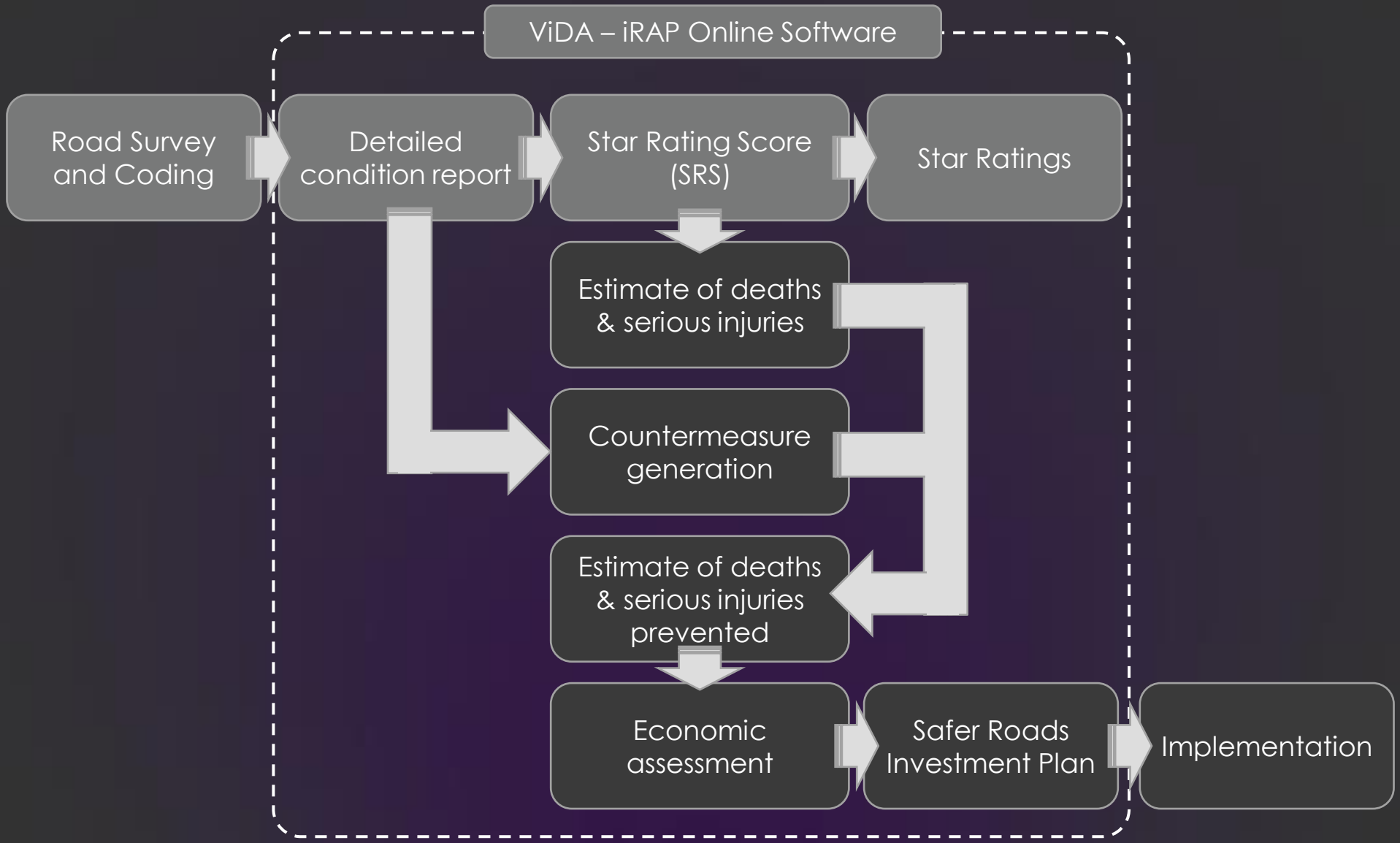
These risk factors have been derived from extensive international research which is in the public domain.

The methodology was pioneered by EuroRap, AusRap and usRap and developed with technical support from:

- Transport Research Laboratories (TRL).
- ARRB Group.
- Midwest Research Institute (MRI).
- Global Road Safety Facility.

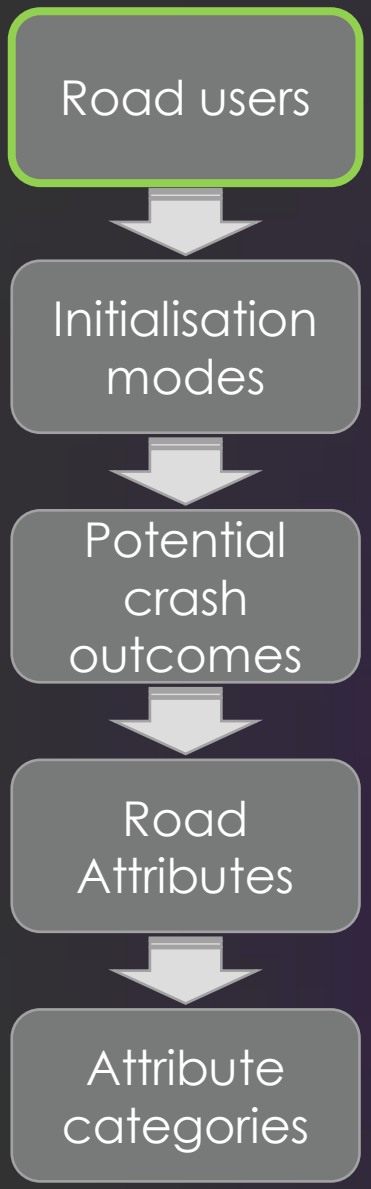
source : iRAP

Positioning the model as a risk mitigation process



source : iRAP

Building blocks of the star rating model

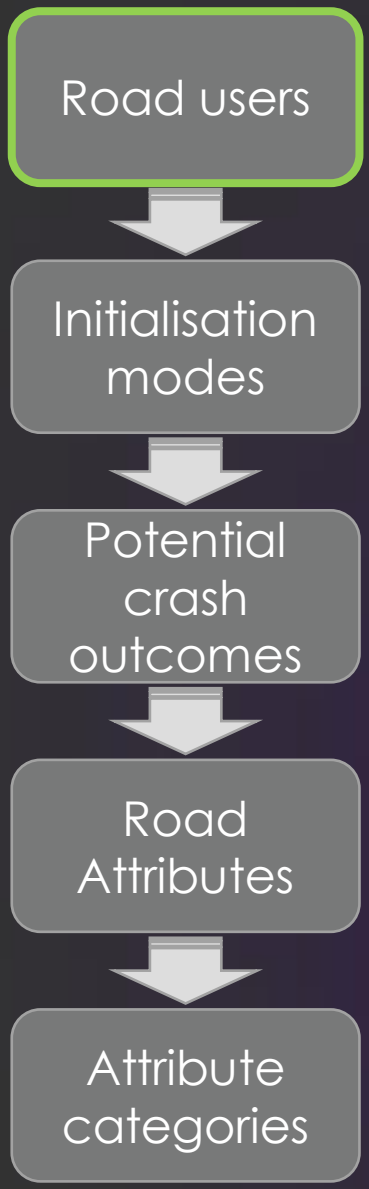


The first level the star rating model considers the primary road user groups:

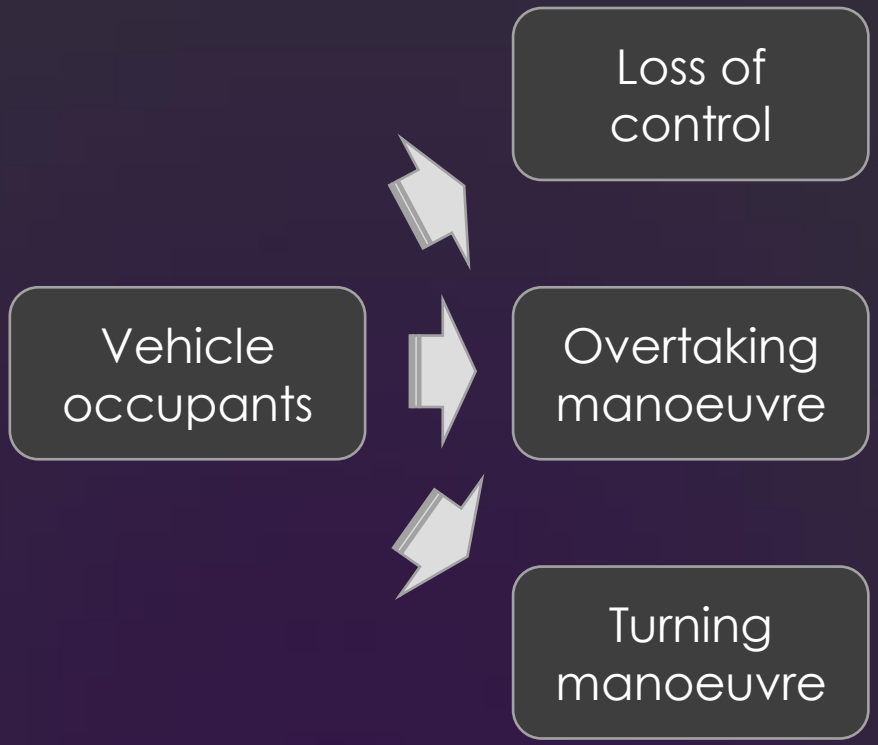
- Vehicle occupants
- Motorcyclists
- Pedestrians
- Bicyclists

source : iRAP

Building blocks of the star rating model



Each user group is then split into potential crash initiation methods.



Building blocks of the star rating model

Road users

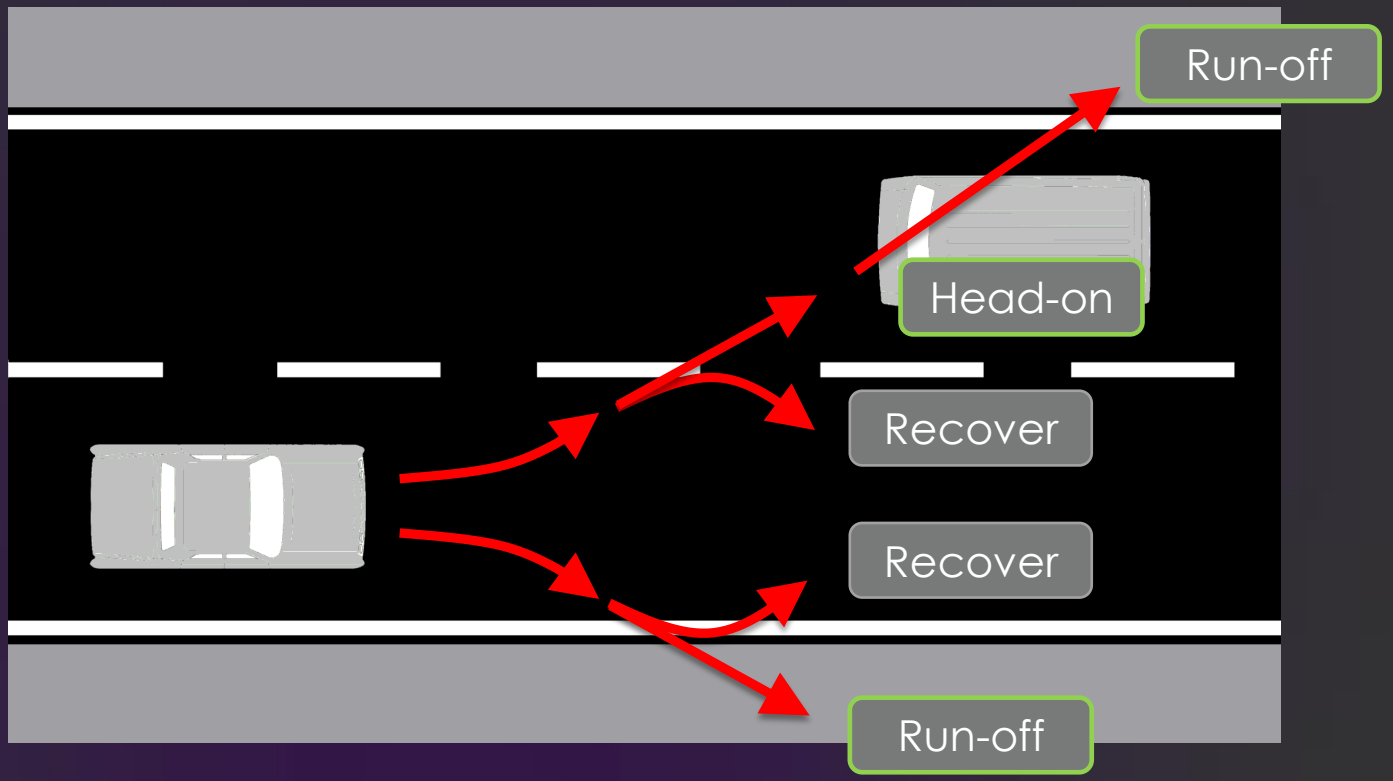
Initialisation modes

Potential crash outcomes

Road Attributes

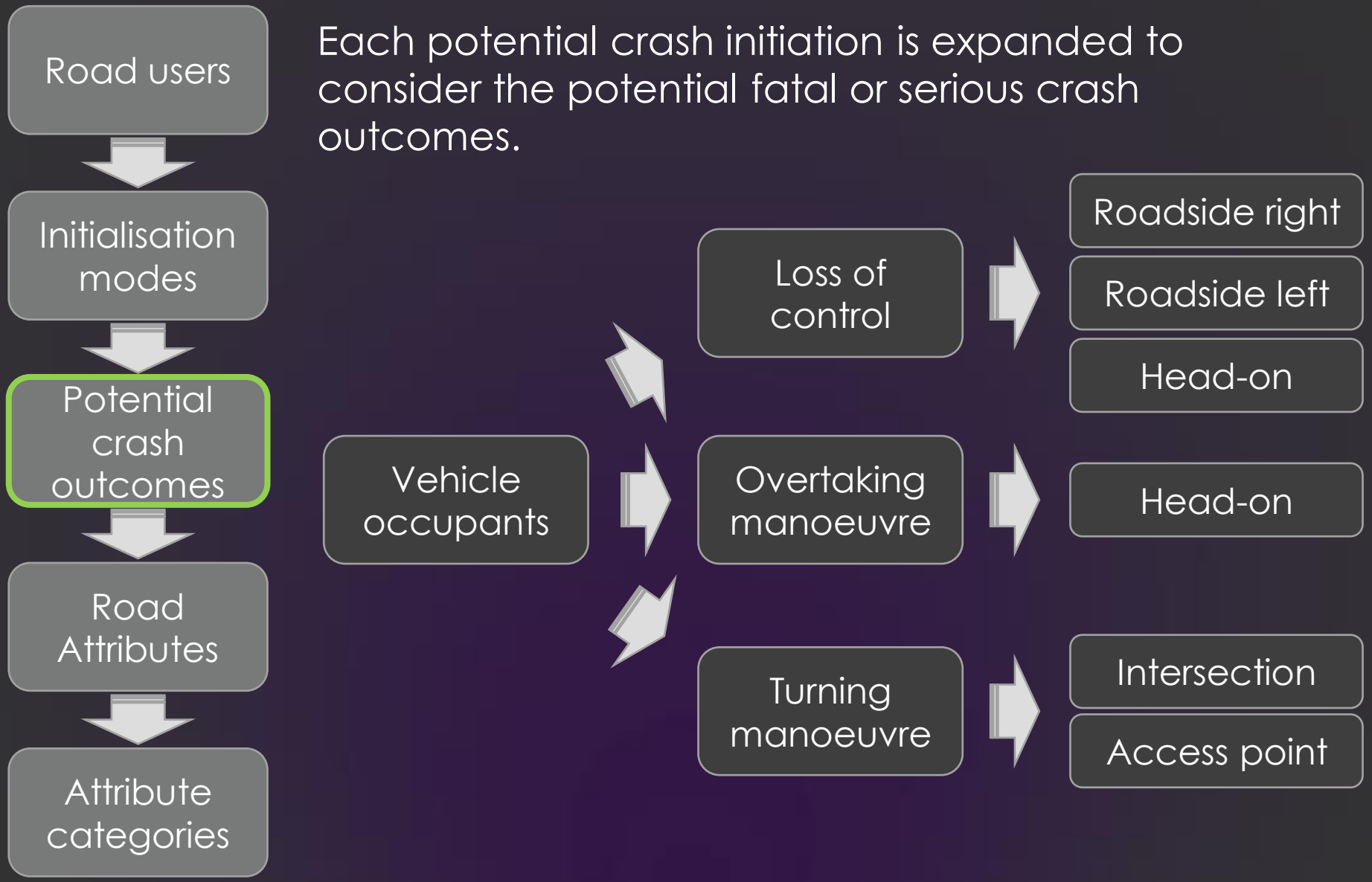
Attribute categories

Each potential crash initiation is expanded to consider the potential fatal or serious crash outcomes.



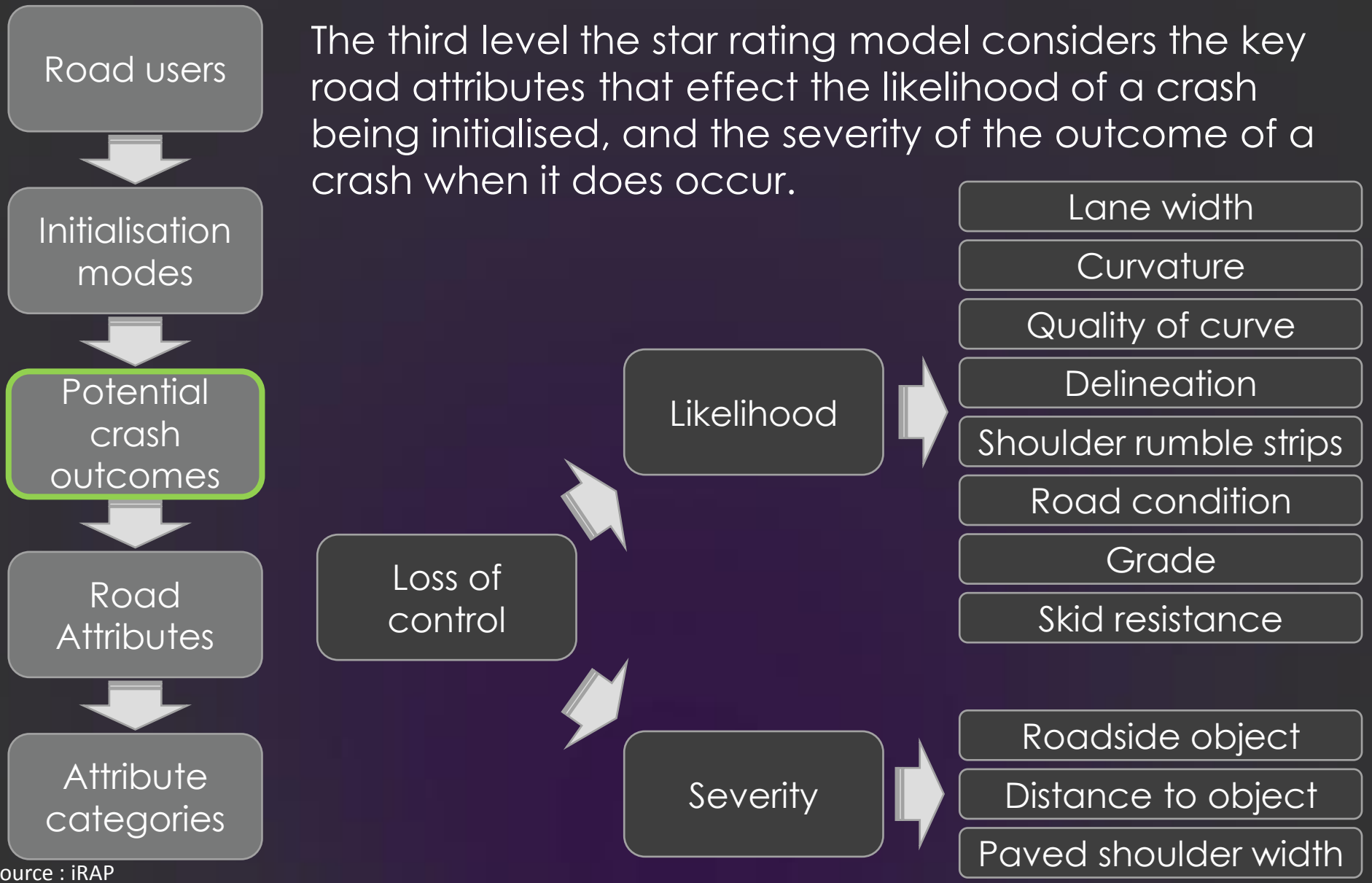
source : iRAP

Building blocks of the star rating model



source : iRAP

Building blocks of the star rating model



source : iRAP

Building blocks of the star rating model

Road users

Initialisation modes

Potential crash outcomes

Road Attributes

Attribute categories

Paved shoulder – left
Side walk provision – left
Roads de object – left
Roadside distance - left

Area type
Speed
Vehicle flow

Motorcycle facility
Bicycle facility
Bicycles flow
Pedestrian flow

Curvature
Quality of curve

Paved shoulder – right
Side walk provision – right
Roads de object – right
Roadside distance - right

Intersection type
Intersection quality
Intersecting volume
Channelisation
Property access point

Crossing facility
Crossing quality
Speed management
Roadworks

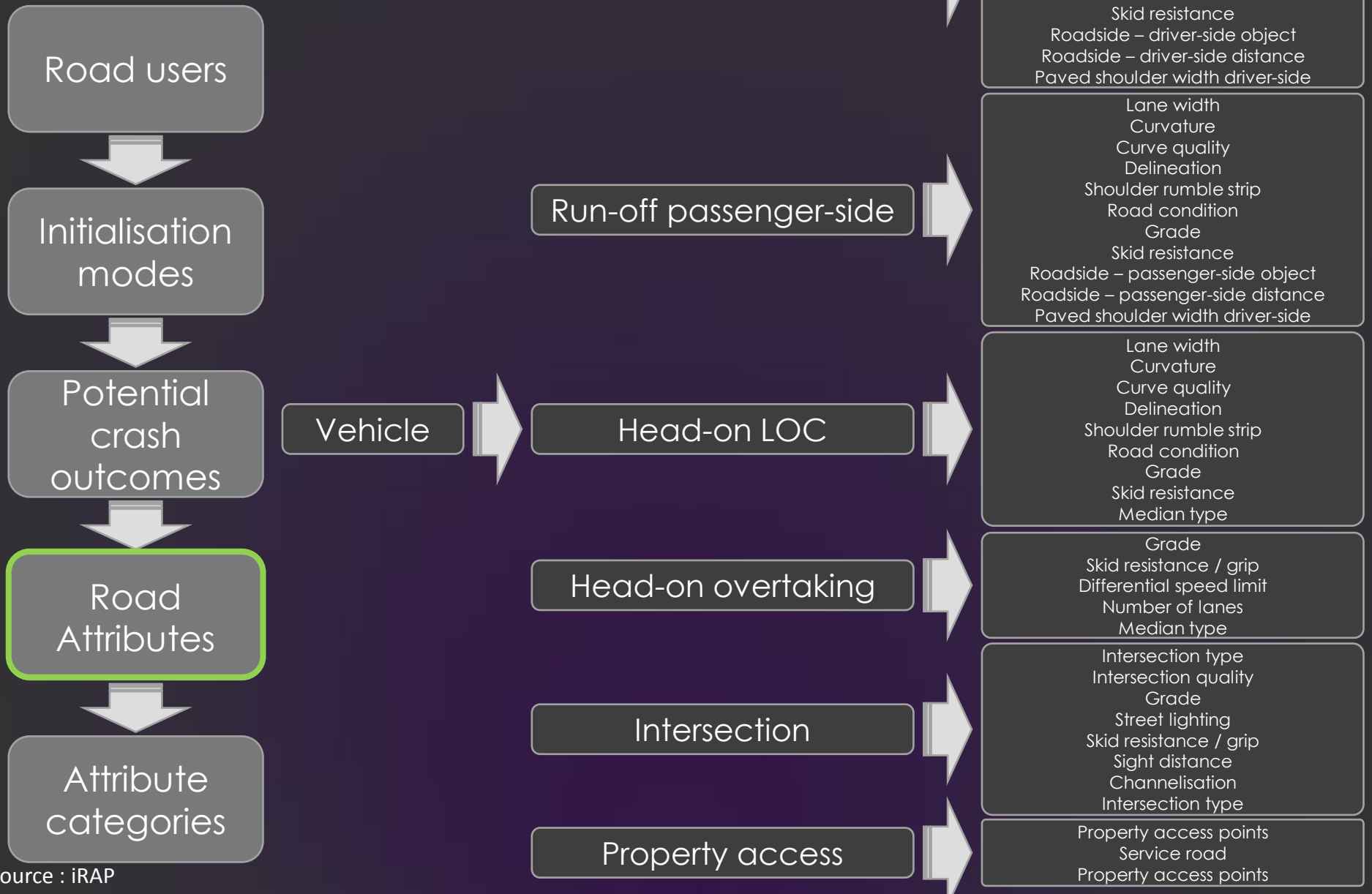
Median
Centreline rumble strips
Sight distance
Delineation
Grade

Street lighting
Shoulder rumble strips
Vehicle parking
Service road
Pedestrian fencing

Lane width
Number of lanes
Road condition
Skid resistance

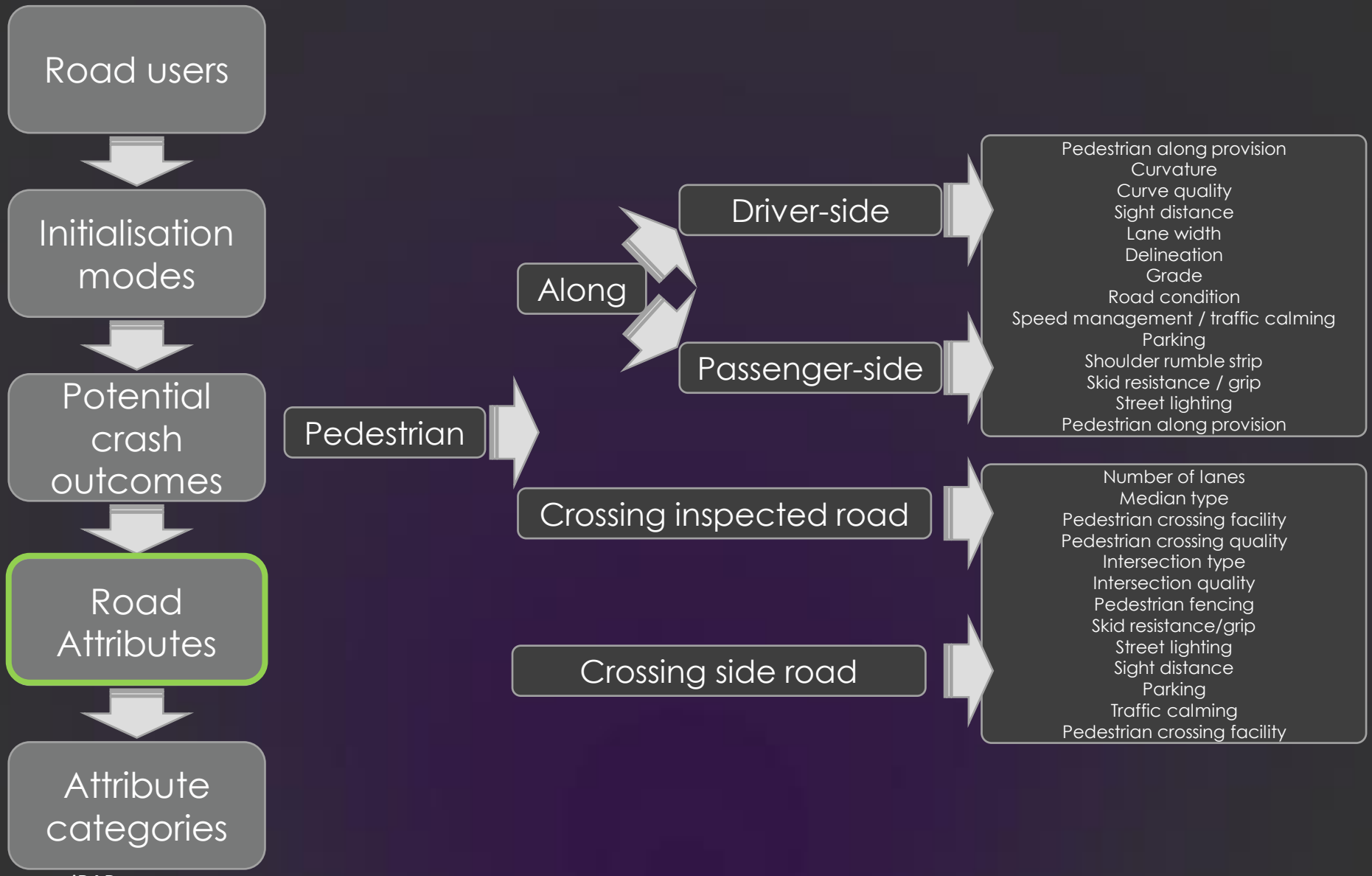
source : iRAP

The model structure - Vehicles



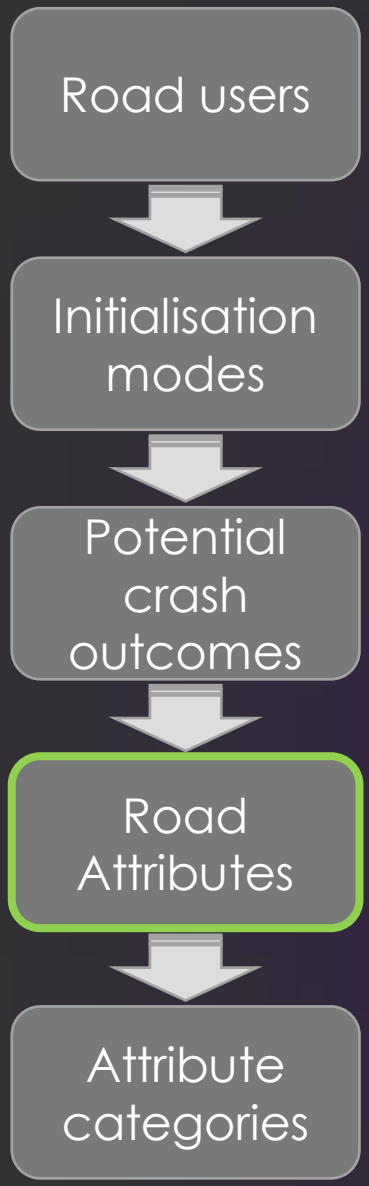
source : iRAP

The model structure - Pedestrian

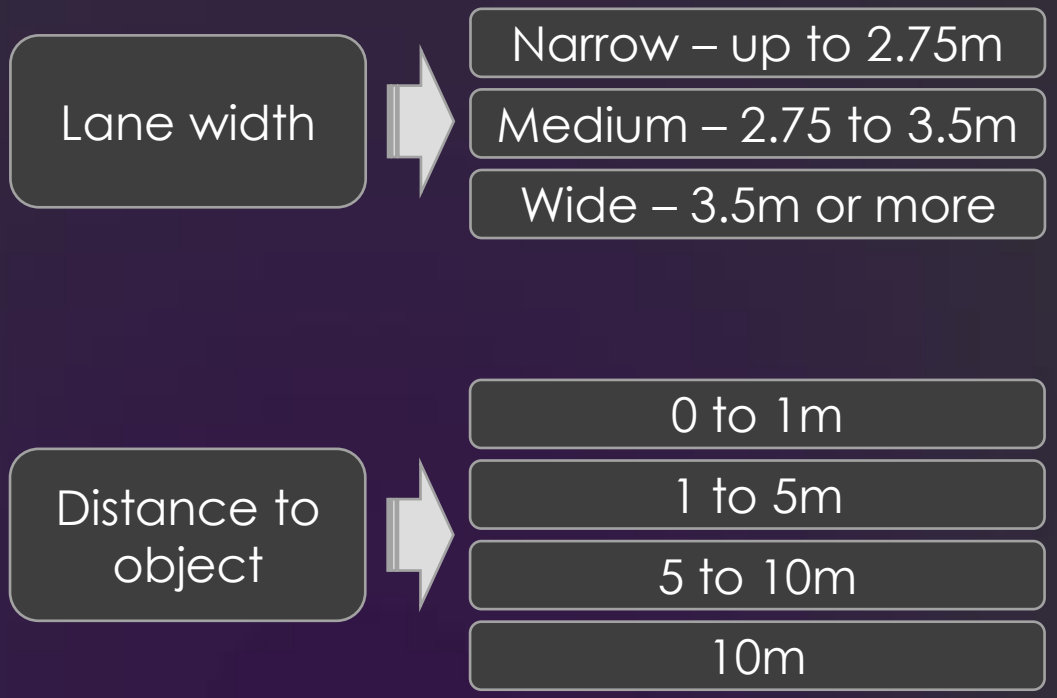


source : iRAP

Building blocks of the Star Rating model



The final level the star rating model divides each attribute into categories that can be coded from a drive through video inspection of the road.



source : iRAP

Attributes categories – risk factors

Each category has a risk factor associated with it.

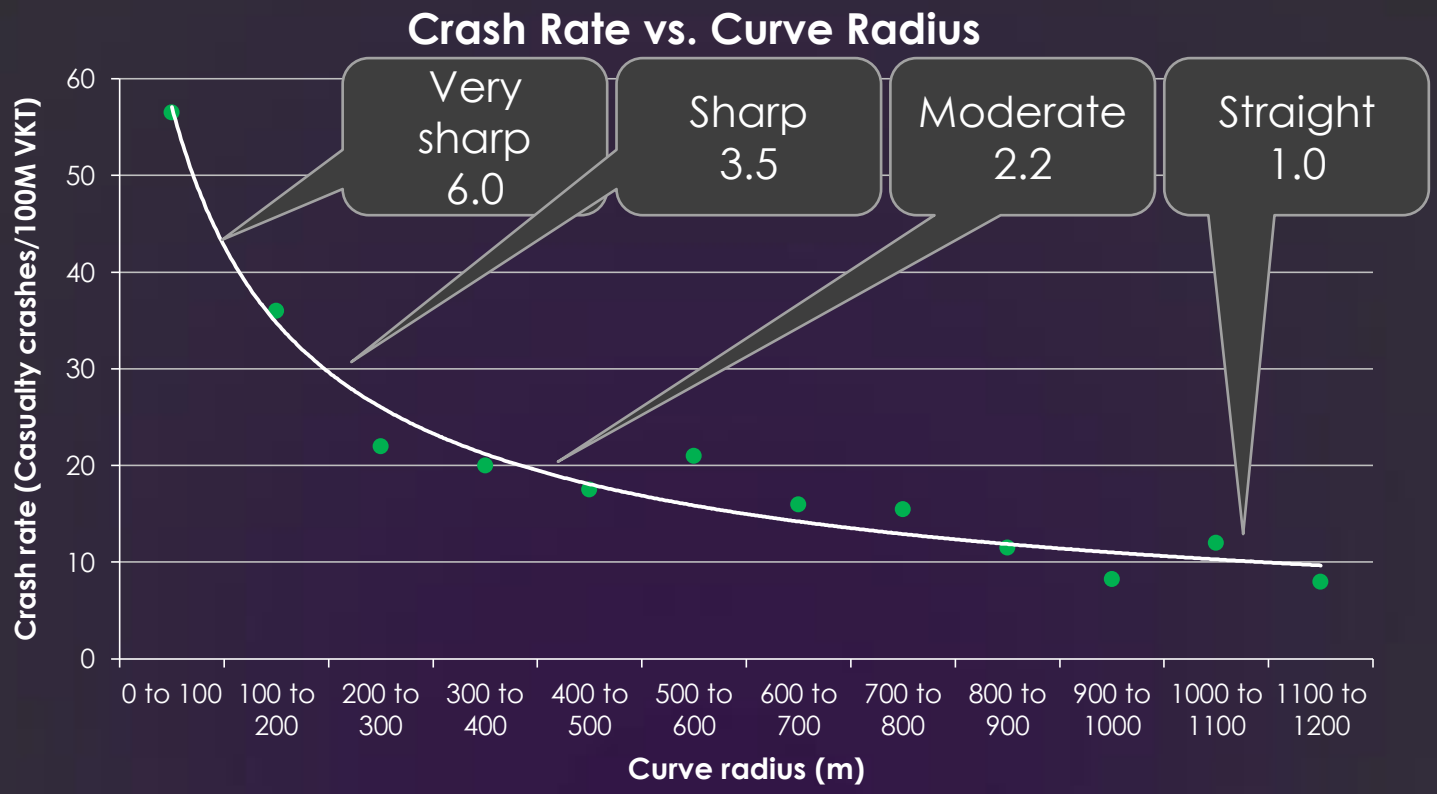
Risk factors reflect the change in risk between the categories of the attribute, for the relevant crash type, for the relevant user group.

The risk factors used within the model are based on published research from around the world.

source : iRAP

Risk factor example

Austroads (2010) Road Safety Engineering Risk Assessment Part 6: Crash Reduction Factors AP-T151/10 Blair Turner, Kelly Imberger, Phil Roper, Victoria Pyta and John McLean ISBN 978-1-921709-11-1



source : iRAP

Calculating crash type risk

Once the risk factors have been selected for a 100m length the relevant factors for each crash type are multiplied together.

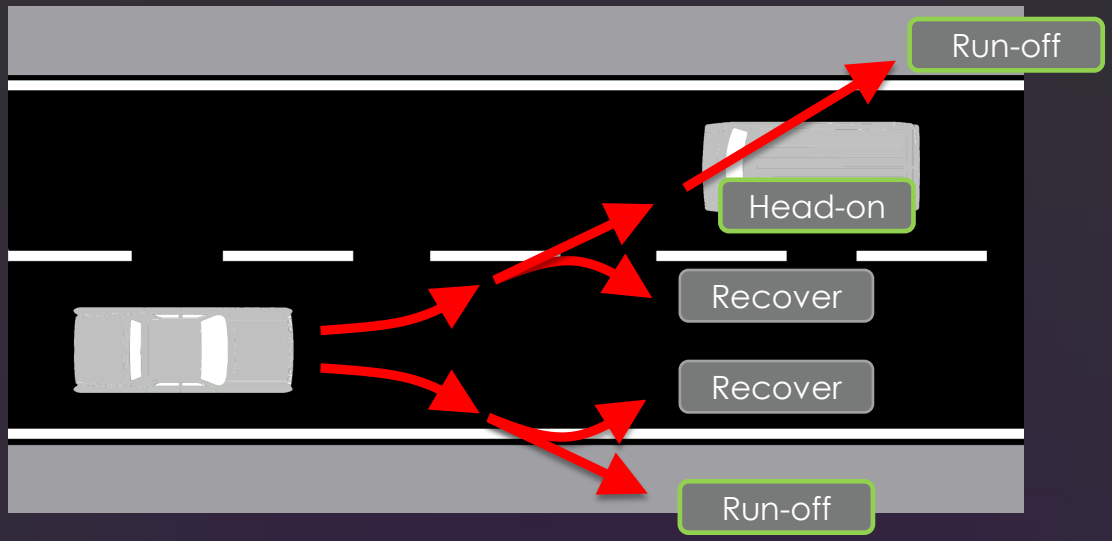
Speed	80km/h	0.152
Vehicle flow	10,000AADT	0.422
Lane width	medium	1.05
Curvature	straight	1.0
Quality of curve	adequate	1.0
Road condition	good	1.0
Grade	0 to 4%	1.0
Skid resistance	Sealed good	1.0
Delineation	adequate	1.0
Shoulder rumble strip	not present	1.25
Roadside object	deep ditch	55
Roadside distance	1 to 5m	0.44
Paved shoulder width	1 to 2.4m	0.83

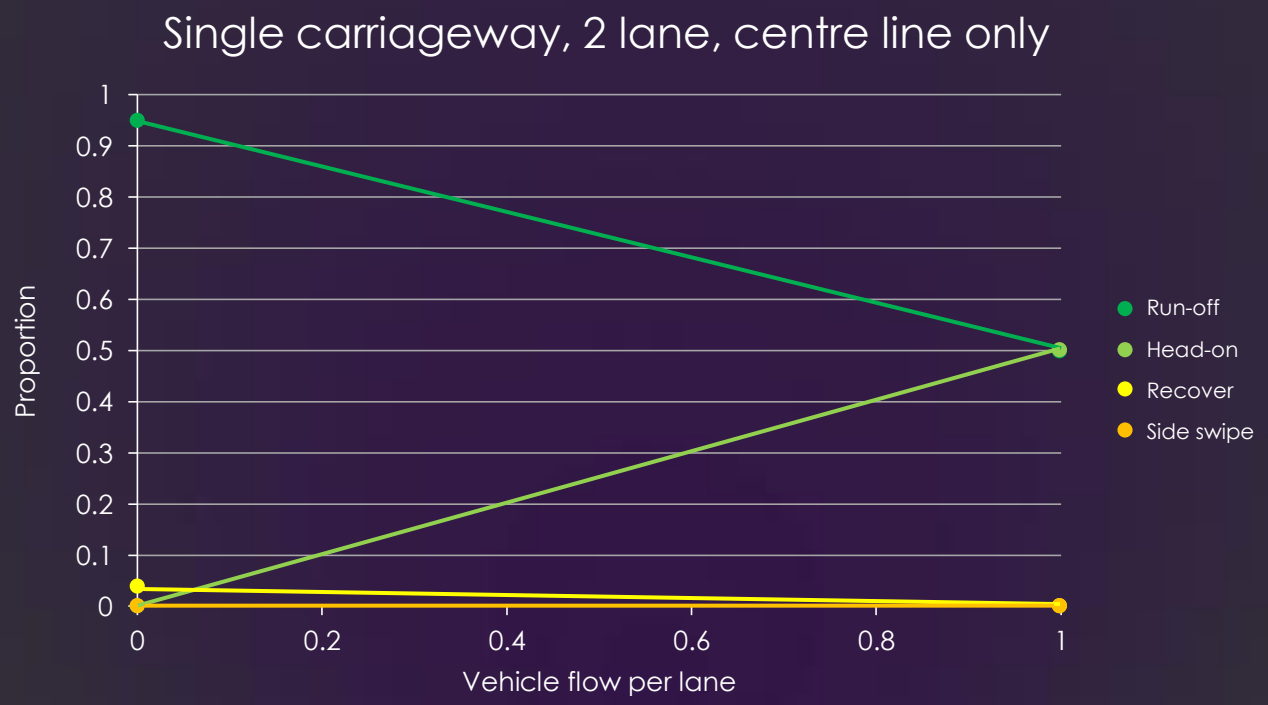
× =

1.69

source : iRAP

Balancing between crash types





source : iRAP

Calculating user group risk

Once the risk of each crash type has been calculated for a 100m length the user group risk is the sum of the relevant crash types.

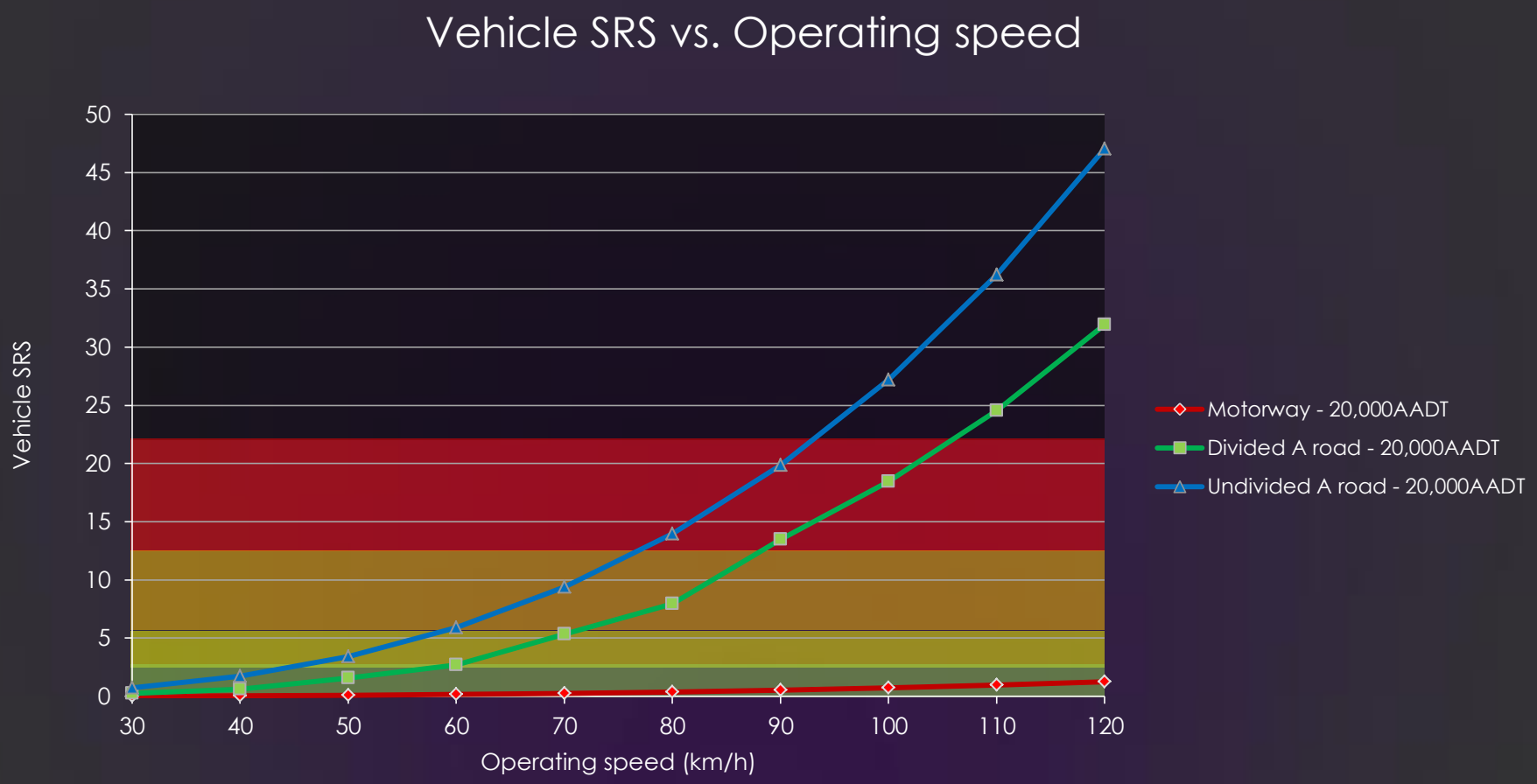
Run-off driver-side	1.69
Run-off passenger-side	3.07
Head-on LOC	2.97
Head-on overtaking	0.55
Intersection	0
Property access	0

= 7.94

source : iRAP

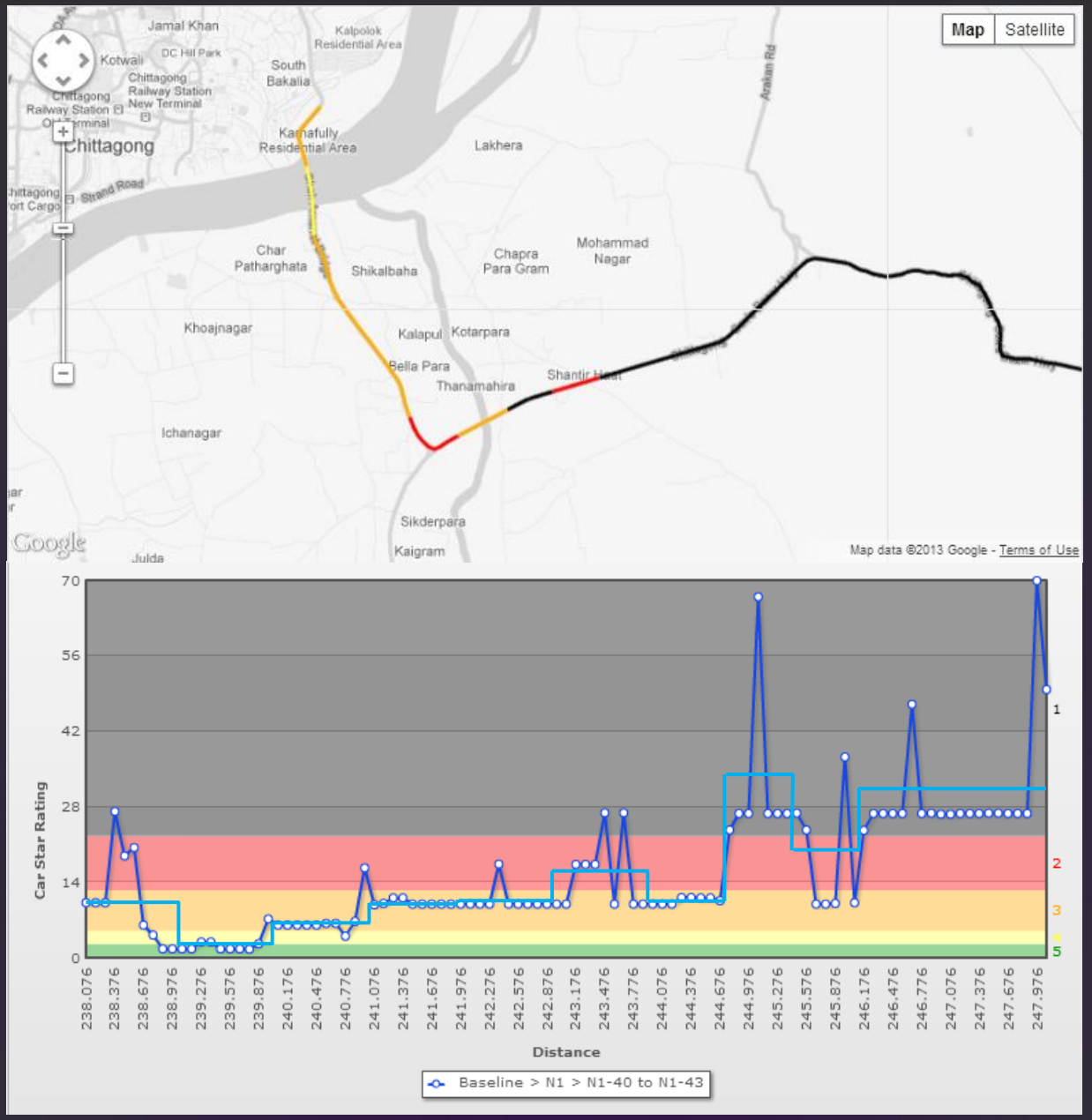
Defining star rating risk bands

Once the total user group SRS has been calculated it is divided into 5 bands that form the Star Ratings.



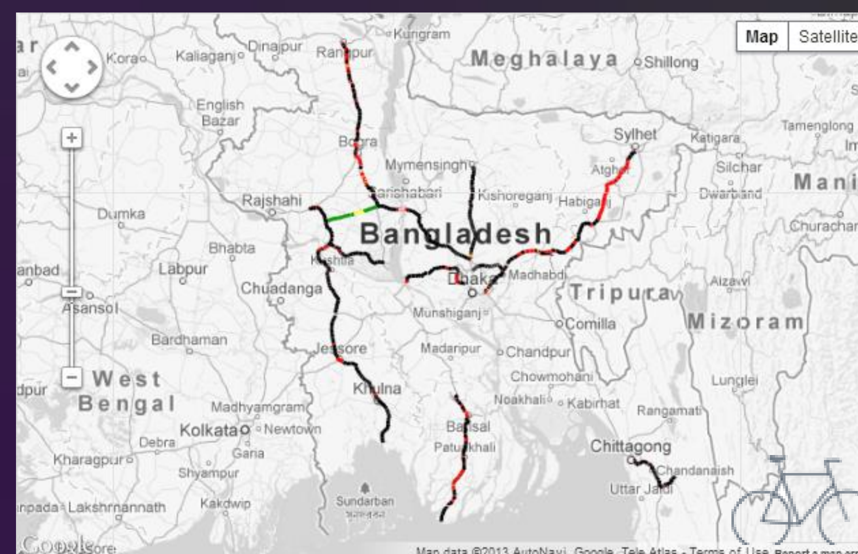
source : iRAP

Smoothing



source : iRAP

Network level maps



source : iRAP

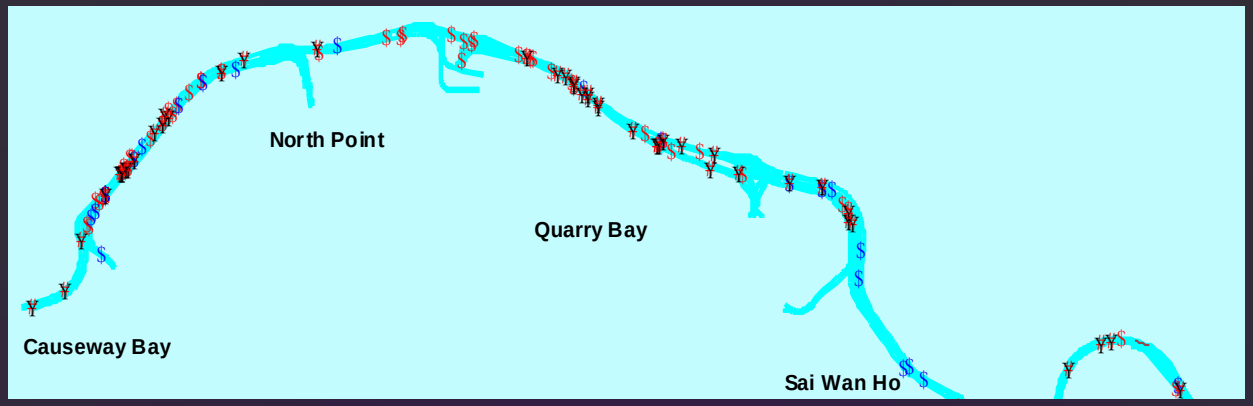
Wide Applications of Star Ratings

Policy	• Setting targets, such as “roads of national importance must be at least 4-stars”
Network planning	• Large-scale risk assessments of existing road networks • Guide investment and track risk over time
Feasibility/concept	• Assessing safety benefits of road projects (new roads and road upgrades) • Developing targeted safety projects
Detailed design	• Assessing risk for design iterations and standard cross sections, guidance on countermeasure options and economic assessments
Evaluation	• Post-construction evaluations • Before and after studies • Performance tracking

source : iRAP

Integration with Other Approaches

Enhancement with detailed site studies, Collision Investigation and Black Site Studies



Technical details may have major influence on safety e.g. safety barrier performance; roundabout geometry

Challenges

Design standard and established practices could prevent adoption of best practices

Considerations for national/local Conditions are necessary e.g. rear-front collision could be a significant risk on expressways

Challenges

Considerations for different vehicle occupants e.g. buses which are an important means of transport in most Asian countries

Source: The Sun

Challenges

Quality of infrastructures

- beyond basic safety needs

Towards integrated safe design – high star rating for all Road-users

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