

STAR RATINGS FOR ROAD SAFETY AUDITS

SR4RSA

DAY 1

DECADE OF ACTION FOR
ROAD SAFETY
2021 - 2030

SUSTAINABLE
DEVELOPMENT
GOALS

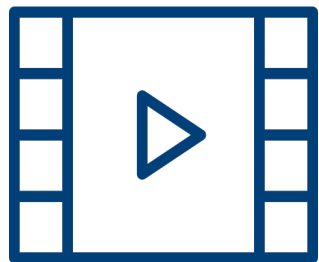
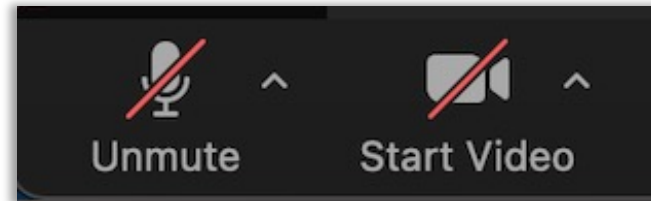
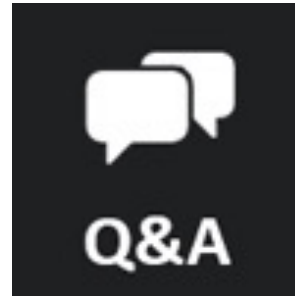


HOUSEKEEPING

WORKSHOP FACILITATOR



Webinar **90 mins**
Questions **15 mins**



Alessandra Françoia

Training and Accreditation Coordinator

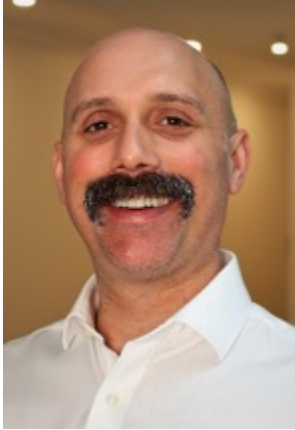
INTERNATIONAL ROAD ASSESSMENT PROGRAMME

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CAREC DIRECTOR



TODAY'S AGENDA

- Purpose of the manual
- Overview of Road Safety Audits
- Overview of iRAP
- Strengths and limitations of RSA and iRAP, safety targets and when they can be used together
- Questions
- 3 approaches for linking iRAP and RSA and focus on Level 1 and the Star Rating Demonstrator
- Questions
- Introduction to Exercise 1 – Using the Star Rating Demonstrator to Star Rate a RSA safety concern and a recommendation

PURPOSE OF THE MANUAL

Help countries position to implement the Global Plan and achieve Global Road Safety Performance Target 3



Undertake road safety audits on all sections of new roads (pre-feasibility through to detailed design) and complete assessments using independent and accredited experts to ensure a minimum standard of 3 stars or better for all road users.

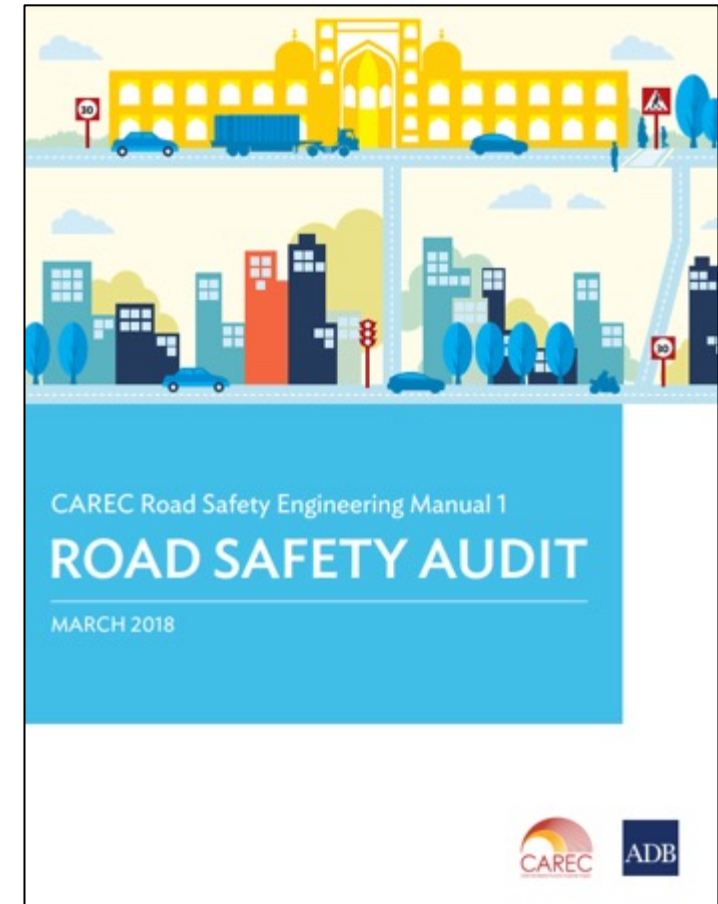
TARGET **3** | 2030



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.

PURPOSE OF THE MANUAL

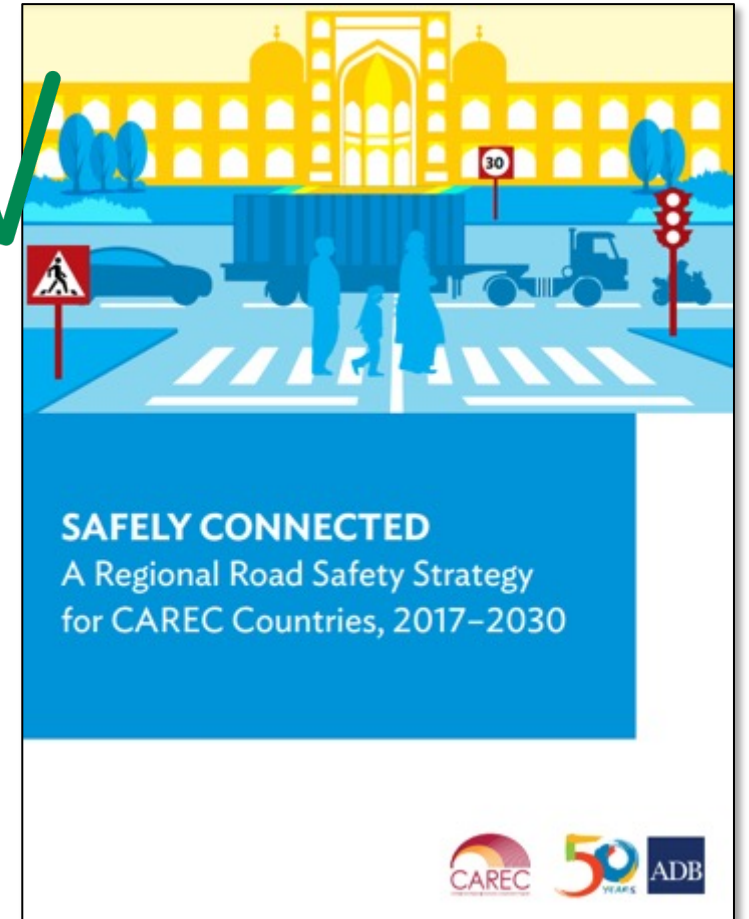
Share approaches for how policy makers and practitioners can use Road Safety Audits (RSA) and iRAP together



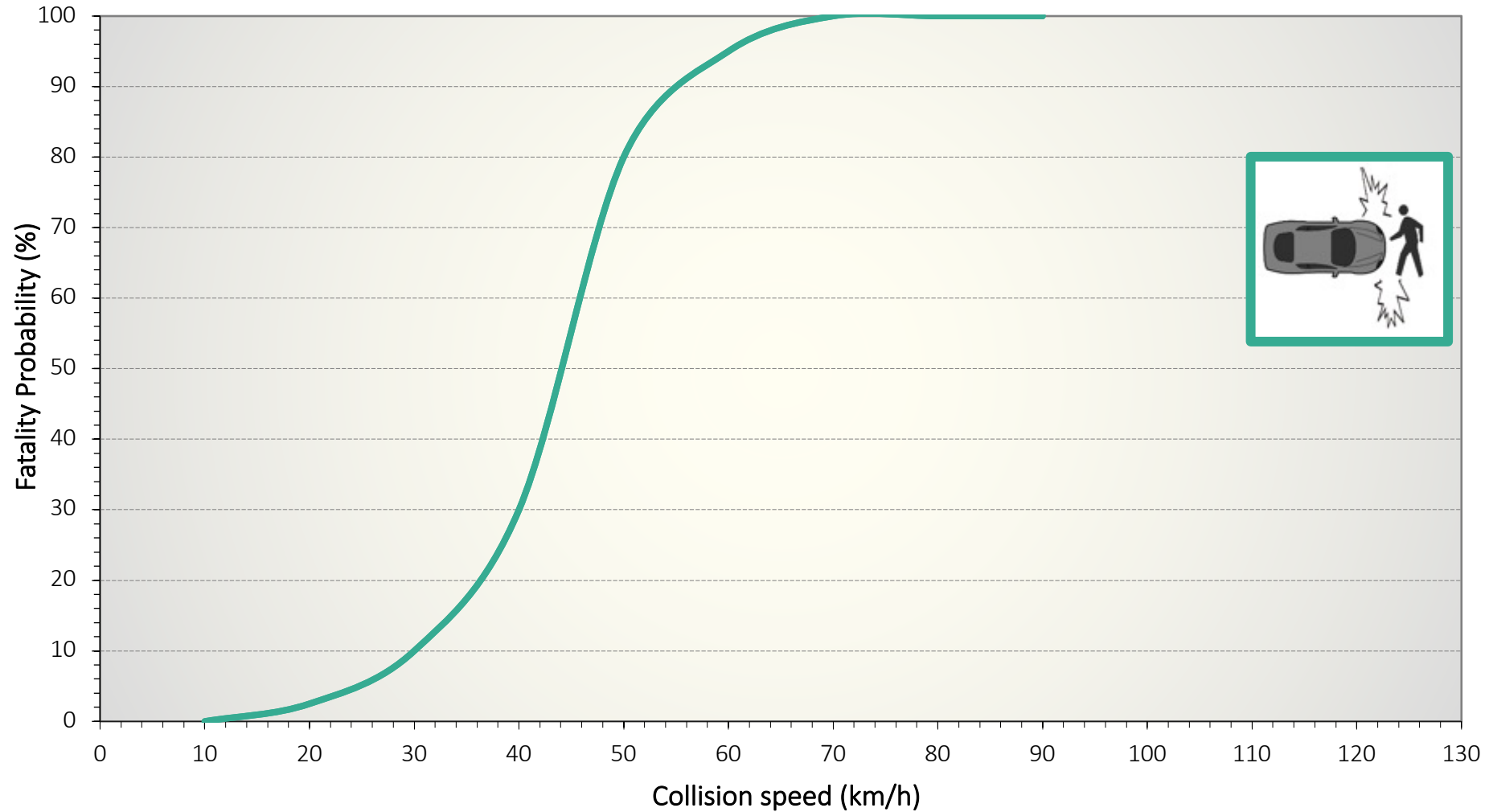
THE SAFE SYSTEM



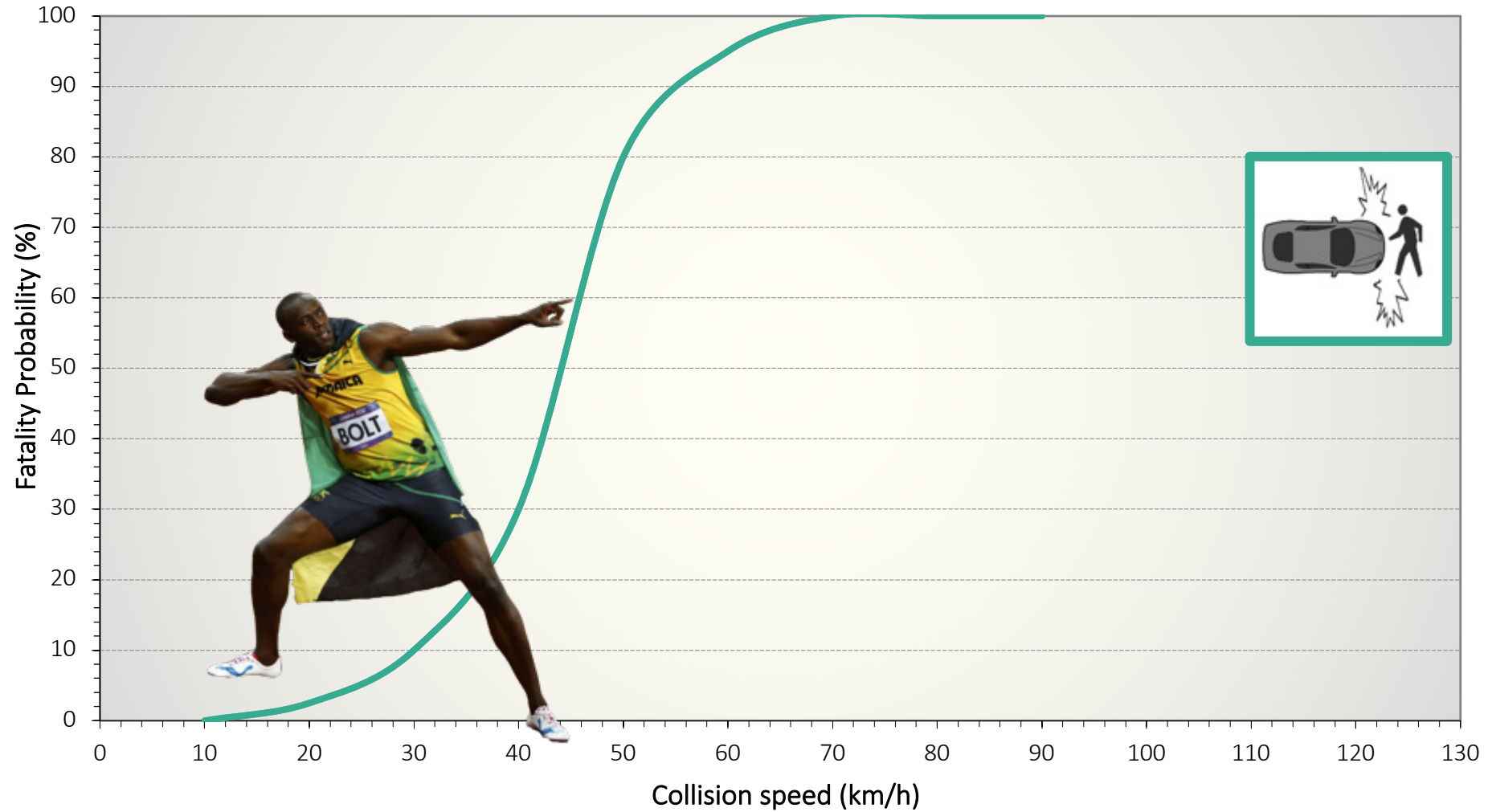
Mistakes, errors of judgment and poor decisions are intrinsic to humans.



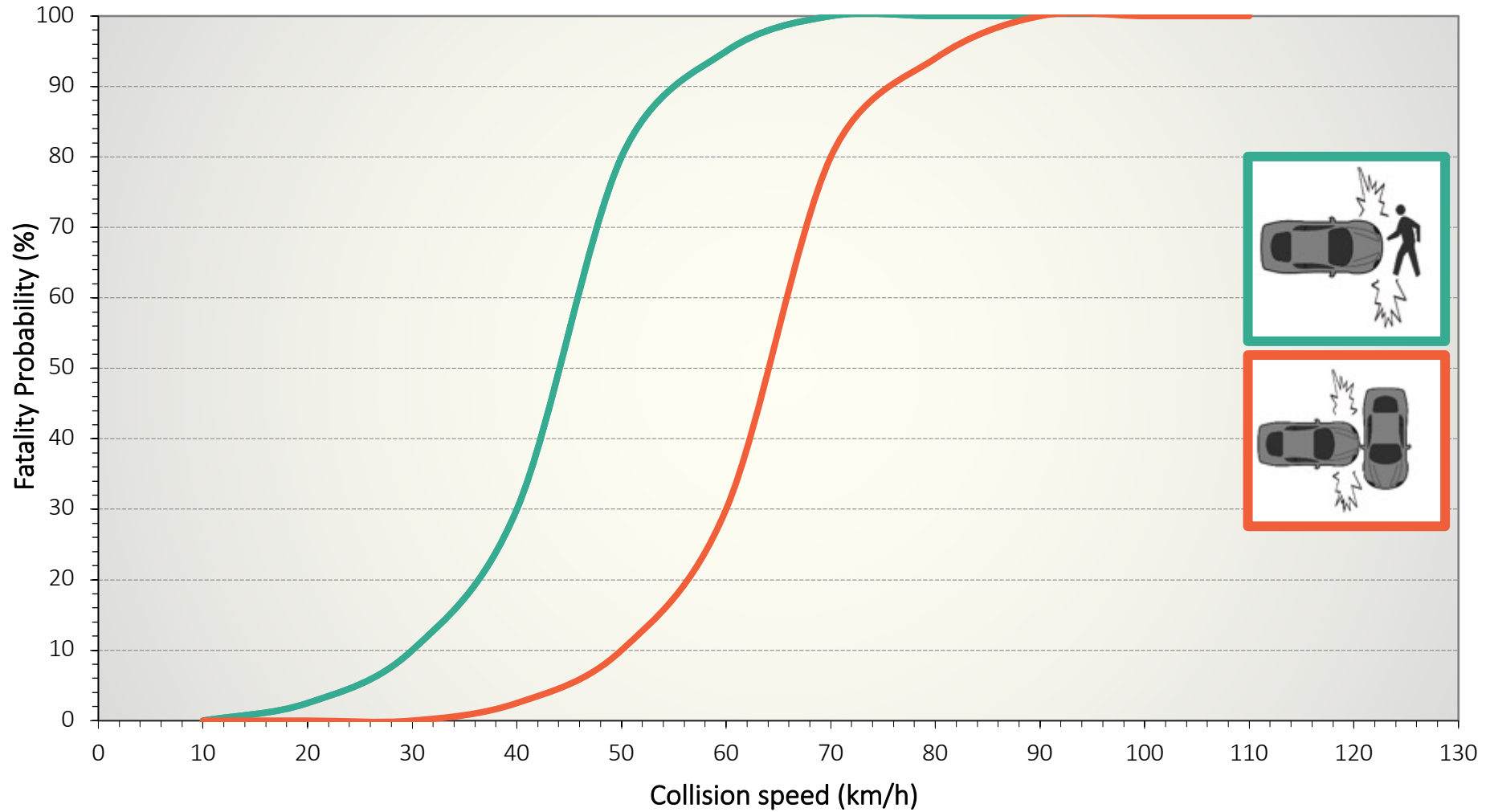
PROBABILITY OF FATALITY & SPEED



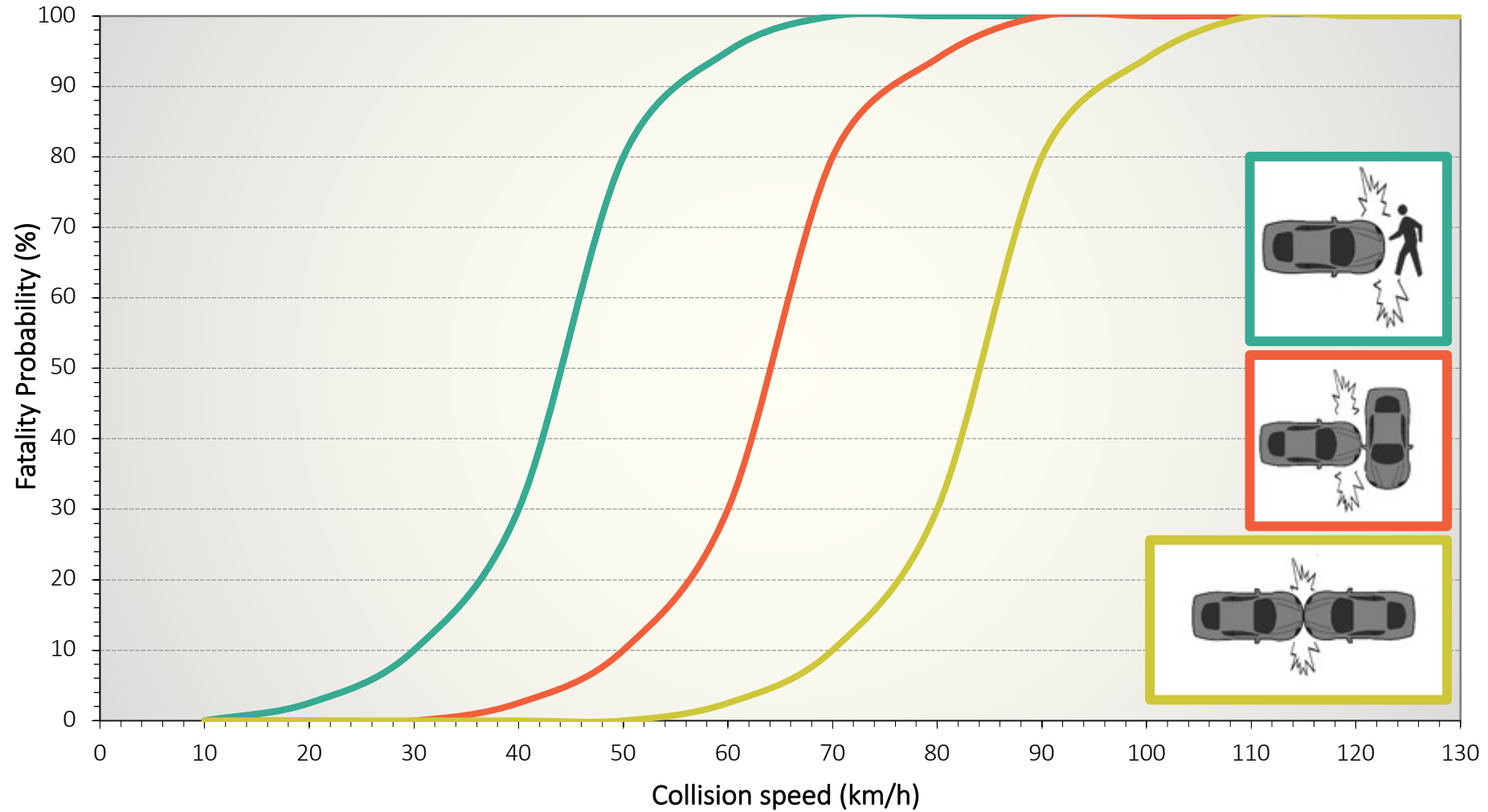
PROBABILITY OF FATALITY & SPEED



PROBABILITY OF FATALITY & SPEED



PROBABILITY OF FATALITY & SPEED



THE SAFE SYSTEM



Mistakes, errors of judgment and poor decisions are intrinsic to humans.



Humans are fragile. Unprotected, we cannot survive impacts that occur at greater than around 30km/h.



The 'engineered' elements of the system - vehicles and roads - can be designed to be compatible with the human element, recognizing that while crashes might occur, the total system can be designed to minimise harm, particularly by making roads 'self-explaining' and 'forgiving' of human error.

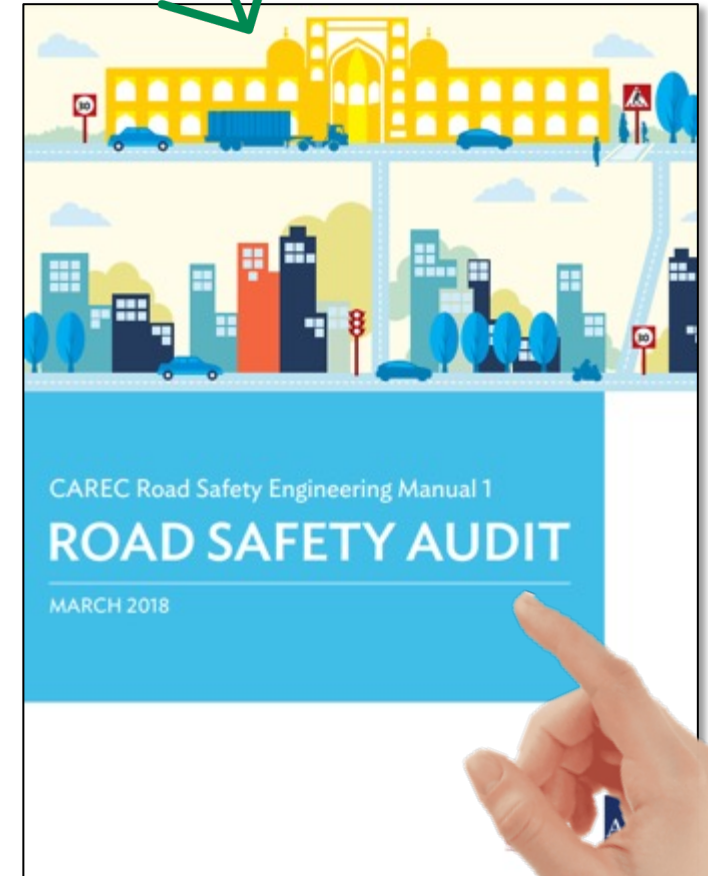


Road safety is a shared responsibility. Those who use roads have a responsibility to act with the safety of themselves and others in mind and comply with laws. Those who design, build, maintain and manage the roads and vehicles have a responsibility to proactively improve the safety of the entire system.



WHAT IS A ROAD SAFETY AUDIT?

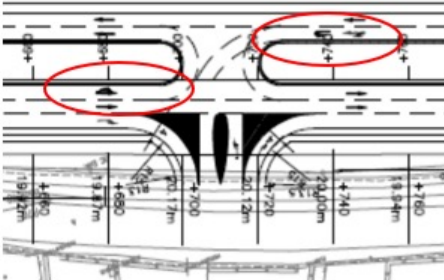
- A formal design review
- Independent of the design
- Qualitative
- Globally well-known



Risk		Frequency of Possible Crash			
		Frequent	Probable	Occasional	Improbable
Severity of Possible Crash	Catastrophic	Intolerable	Intolerable	Intolerable	High
	Serious	Intolerable	Intolerable	High	Medium
	Minor	Intolerable	High	Medium	Low
	Limited	High	Medium	Low	Low

WHAT IS A ROAD SAFETY AUDIT?



Ref	Safety Concern	Risk	Recommendation	Client Response
1.1	<p>At Km 15+710, a median opening and a T junction are proposed for access to the Village Access Road. The median opening will also serve as a U-turn opportunity. However, there are no sheltered left turn lanes proposed in the median for either direction. This may result in rear-end collisions at this location as vehicles slow down to turn from the “fast” lane. The risk of this crash is increased due to the speed of vehicles.</p> 	Medium	<ul style="list-style-type: none"> Provide sheltered left turn lanes on both approaches to the break in the median. 	

QUESTIONS?



ABOUT IRAP



Charity for a world free of high-risk roads

Global standard for safety assessments

38,000 people in training/events

155 accredited suppliers

Used by 100+ countries

2.5 million km of assessments

Helped make \$80 billion of road investments safer

IRAP PHILOSOPHY

There are three guiding principles:

- Road fatalities are largely avoidable and for large sectors of the world's population road death is the biggest fatality risk
- Road designs that help the motorist understand what to do and forgive driver errors when they happen can cut out a large proportion of these fatalities
- Targeted interventions to improve existing roads has a very good economic payback



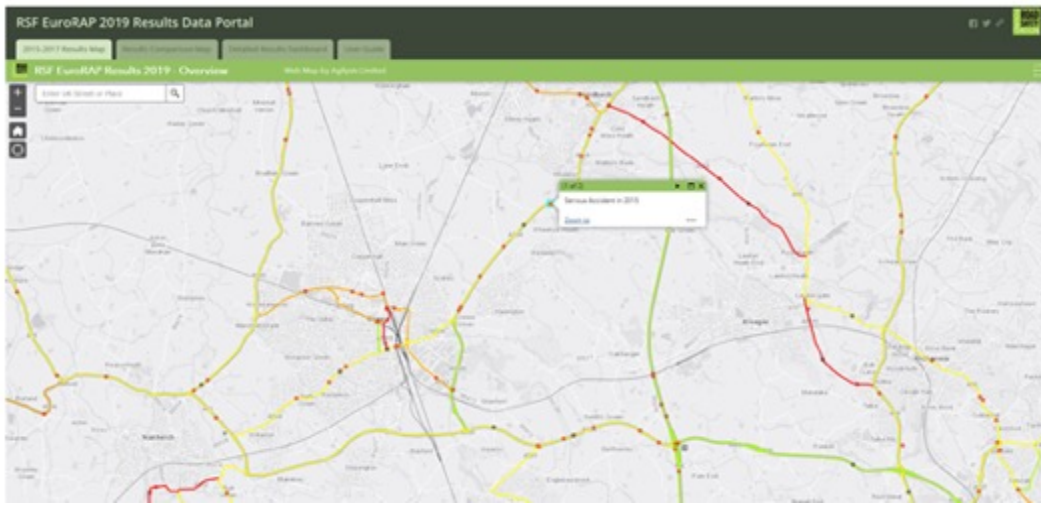
STAR RATINGS



SAFER ROADS INVESTMENT PLANS



CRASH-RATE RISK MAPS



PERFORMANCE TRACKING



STAR RATING AND SAFER ROADS INVESTMENT PLAN PROCESS



Road Survey



Implementation



Design Stars



Road Coding



Star Ratings



Priority Safety Countermeasures



WHAT IS STAR RATING?



- The Star Rating model has been developed with the help of world-leading road safety research agencies
- Star Rating is based on road inspection data
- Simple and objective measure of the level of safety which is 'built-in' to the road
- 5-star road segments are the safest, while 1-star are the least safe
- Star Ratings can be undertaken on all roads around the world, in urban and rural areas and without reference to detailed crash data

Brazil
Vehicle occupants: ★★★★★

- Roadside safety barriers
- Median safety barriers
- Good delineation
- Wide paved shoulders
- No intersection
- Straight
- Two lanes each direction
- 80km/h

China
Bicyclists / e-bicyclists: ★★★★★

- Bicycle lane
- Street lighting
- Good pavement
- No intersection
- No vehicle parking
- Two lanes each direction
- Good sight distance
- 50km/h

Costa Rica
Vehicle occupants: ★★☆☆☆

- Adequate delineation
- Good pavement
- Moderate curve
- Narrow paved shoulders
- 80km/h
- Roadside hazards
- Intersection
- Undivided

Australia
Pedestrians: ★★★★★

- 40km/h
- Footpaths
- Raised pedestrian crossing
- Street lighting
- 1 lane in each direction
- Good sight distance
- Managed parking
- Median island

Cayman Islands
All road users: ★★★★★

- 56km/h (35 mph)
- Footpath and crossing
- Straight
- Paved shoulder
- Street lighting
- No bicycle lane
- Intersection
- Poor delineation

India
Motorcyclists: ★★★★★

- Good surface condition
- Moderate curve
- 80km/h
- Undivided
- Roadside hazards
- No paved shoulder
- Poor delineation
- No street lighting

Vietnam
Motorcyclists: ★★★★★

- Motorcycle lane
- Street lighting
- Good delineation
- No intersection
- Good sight distance
- Narrow paved shoulders
- 80km/h
- Roadside hazards

Philippines
Pedestrians: ★★★★★

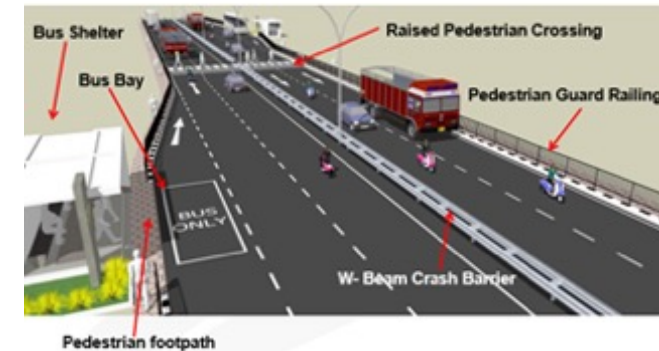
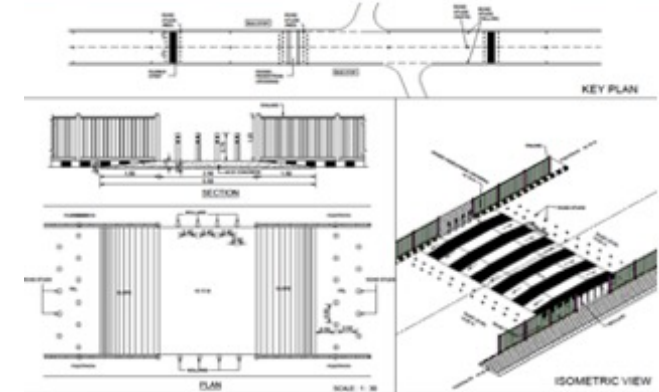
- One lane each direction
- Good sight distance
- 80km/h
- Narrow paved shoulder
- No formal footpath
- No pedestrian crossing
- No school zone
- No street lighting

Brazil
Bicyclists: ★★★★★

- No intersection
- Good sight distance
- 80km/h
- No bicycle facilities
- No street lighting
- Poor pavement
- No shoulder
- Poor delineation

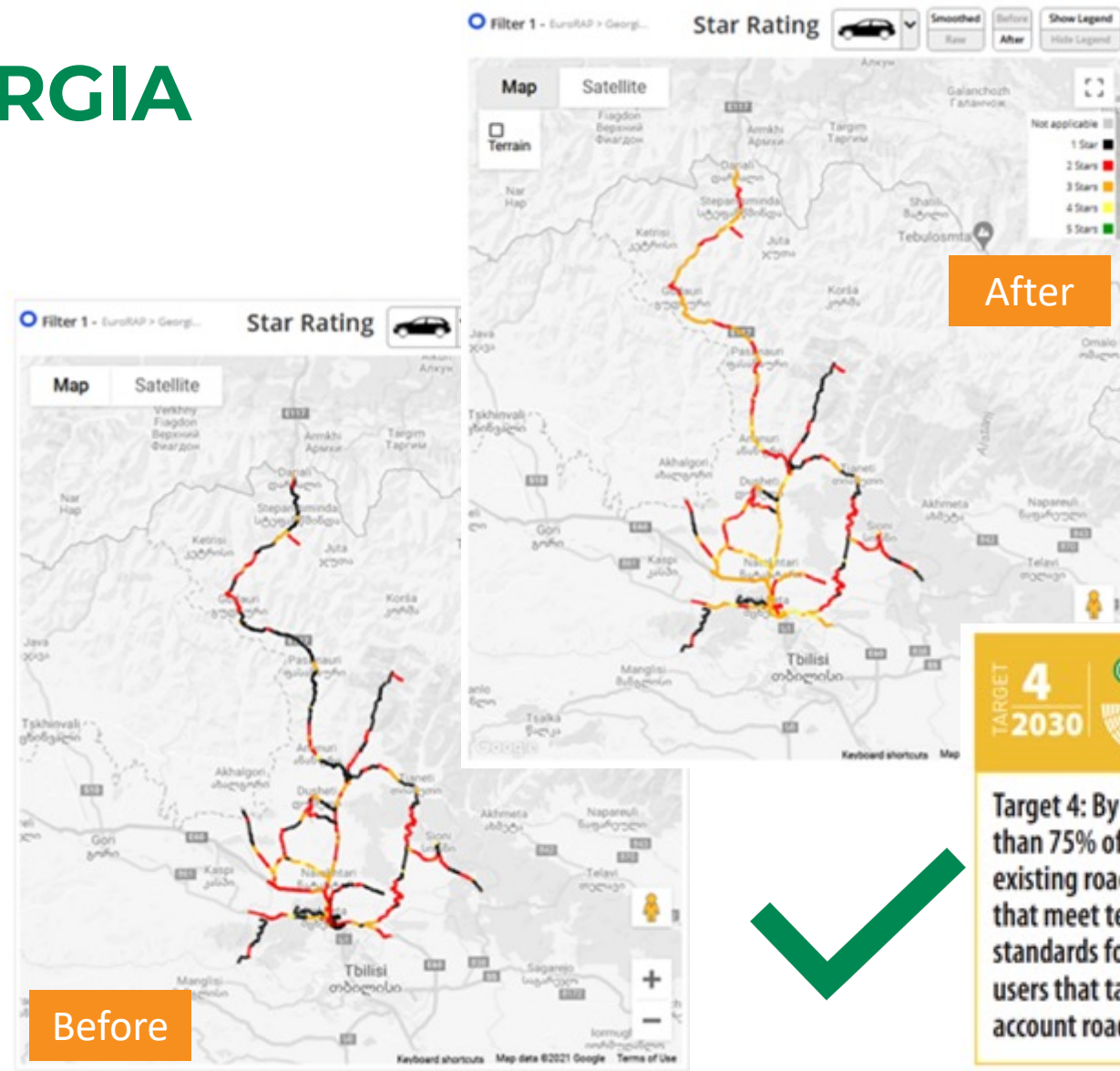
SAFER ROADS INVESTMENT PLAN

- How can we improve the safety in an affordable way?
- What is feasible in terms of engineering and what would it cost?
- How many deaths and serious injuries would we prevent?
- Provides a list of economically viable road safety treatments
- Based on more than 90 proven road safety countermeasure options
- Designed to reduce numbers of deaths and serious injuries



IRAP EXAMPLE: GEORGIA

- Roads Department with World Bank
- 500km assessments: <20% of travel occurs on roads rated 3-stars or better
- Scenario: reduce speeds on undivided urban stretches and selected rural stretches plus cost-effective infrastructure
- Result: reduce serious trauma by 57%, save more than 4,000 deaths and serious injuries over 20 years, BCR > 5:1
- Result: 75% of travel would be on roads rated 3-Stars or better



QUESTIONS?

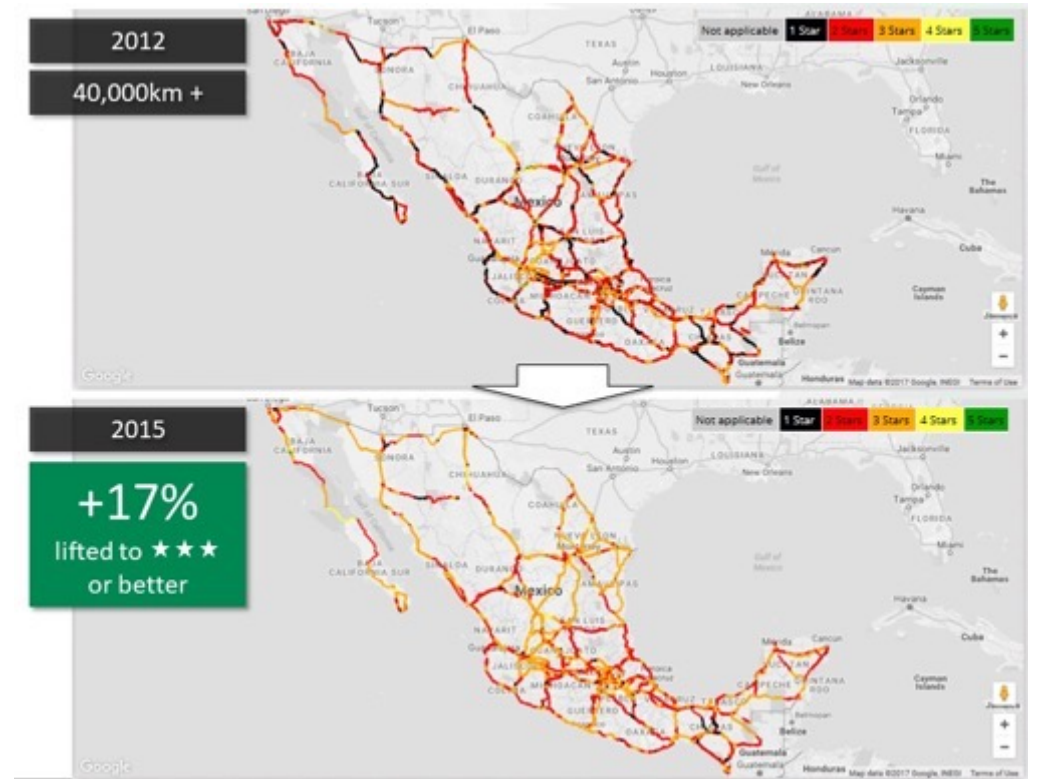


WHY?

EXPERIENCE + DATA = OPTIMAL OUTCOME



+

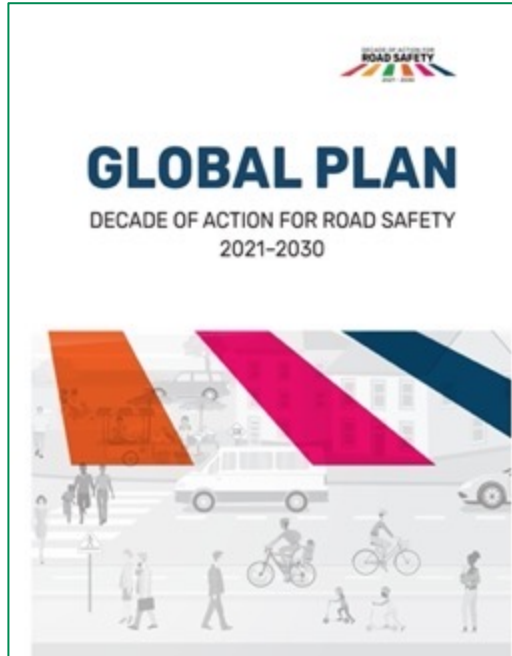


WHY?

EXPERIENCE + DATA = OPTIMAL OUTCOME

Item	Road Safety Audit	iRAP Assessment
Strengths	<ul style="list-style-type: none">• Expert experience• Relatively easy, can be low cost• All safety concerns• Any level of detail• All road users, their capabilities and limitations• All stages of design• All types of roads• Day and night	<ul style="list-style-type: none">• Global standard, highly repeatable• Vehicle occupants, motorcyclists, pedestrians and bicyclists• Can be 100 metre or an entire network• Objective metrics enables targets and economic analysis• All existing roads and designs• Results in a central web platform and global training and accreditation
Limitations	<ul style="list-style-type: none">• No global standard• Very dependent on expertise of auditor• Subjectivity• Challenging on long lengths• Vulnerable road users sometimes neglected• Tend towards low-cost but low-impact treatments• No financial or quantified impact analysis	<ul style="list-style-type: none">• Fixed list of attributes• Segment lengths fixed at 100 metres• performed in daylight and does not consider weather• The quality of results depend on the quality of input data• Results can be misinterpreted• Data requirements for a full assessment

WHY? SETTING OBJECTIVE TARGETS



Undertake road safety audits on all sections of new roads (pre-feasibility through to detailed design) and complete assessments using independent and accredited experts to ensure a minimum standard of 3 stars or better for all road users.

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.

WHY? SETTING OBJECTIVE TARGETS

Example

The design must achieve a minimum of 3-stars for all road users

The design must achieve an improvement in star ratings for all road users relative to the existing road

The design must achieve a minimum of 3-stars for all road users and where the design traffic flow is more than 50,000 vehicles per day, the design must achieve a minimum of 4 stars for all users

The design must achieve a minimum of 3-stars for all road users and for sections that pass through linear settlements the design must achieve a minimum 4-star standard for pedestrians and cyclists

The design must achieve a minimum of 3-stars for pedestrians where peak flows are greater than 5 people per hour

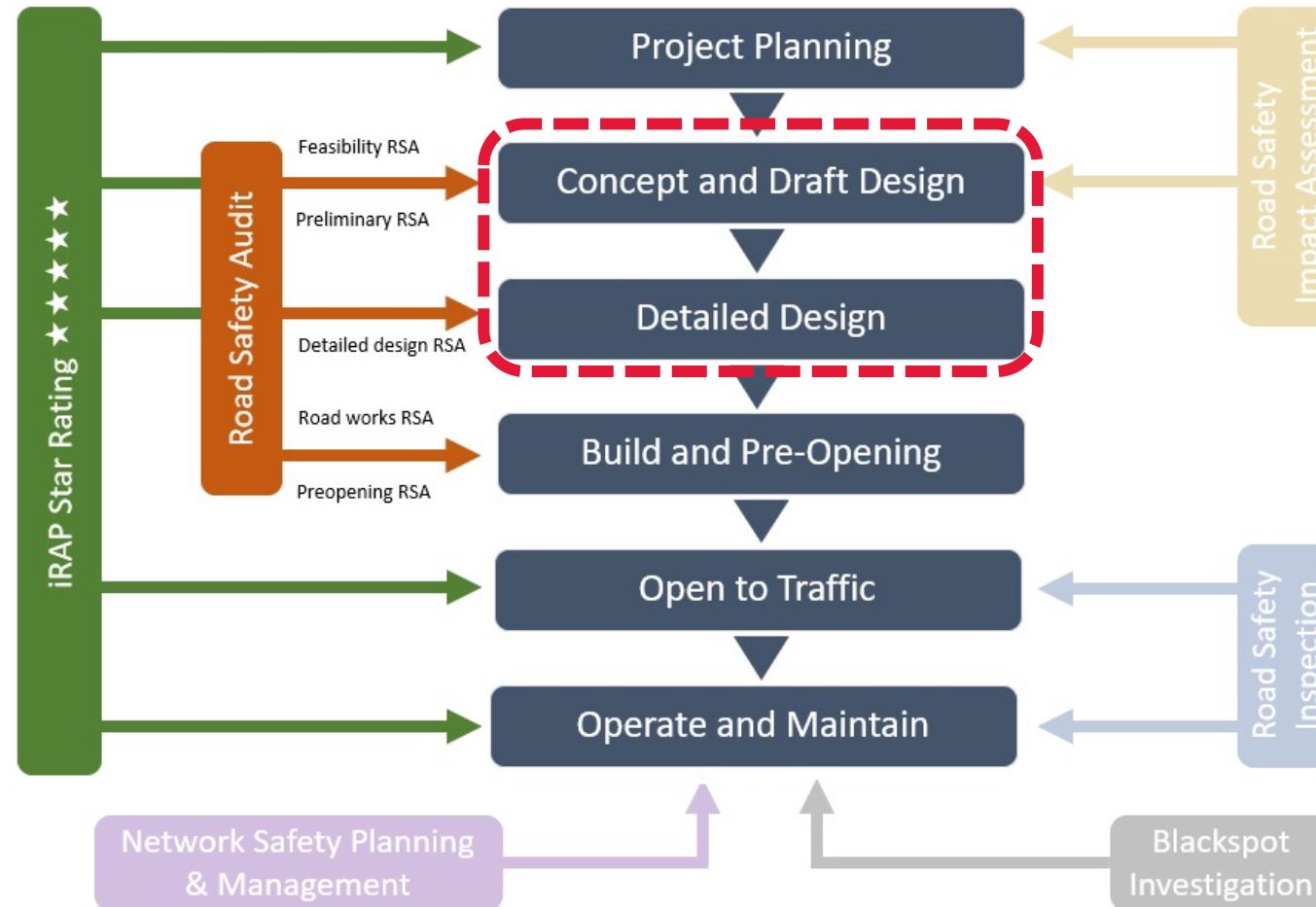
The design must provide sidewalks along 100% of the length

The estimated number of fatalities and serious injuries associated with the design must be X% less than the existing road.

The estimated number of fatalities and serious injuries associated with the design must not exceed X per year.

The estimated number of fatalities and serious injuries per vehicle km travelled must be lower than the average for the type of road

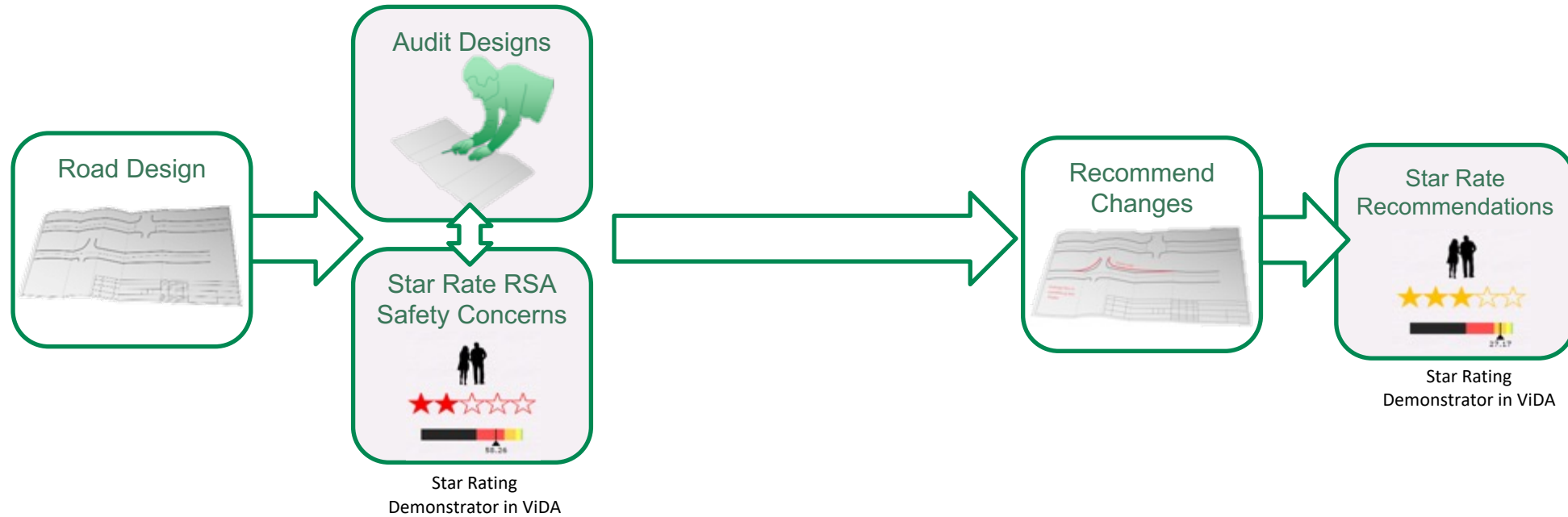
WHEN? EARLIER IN DESIGN IS BETTER



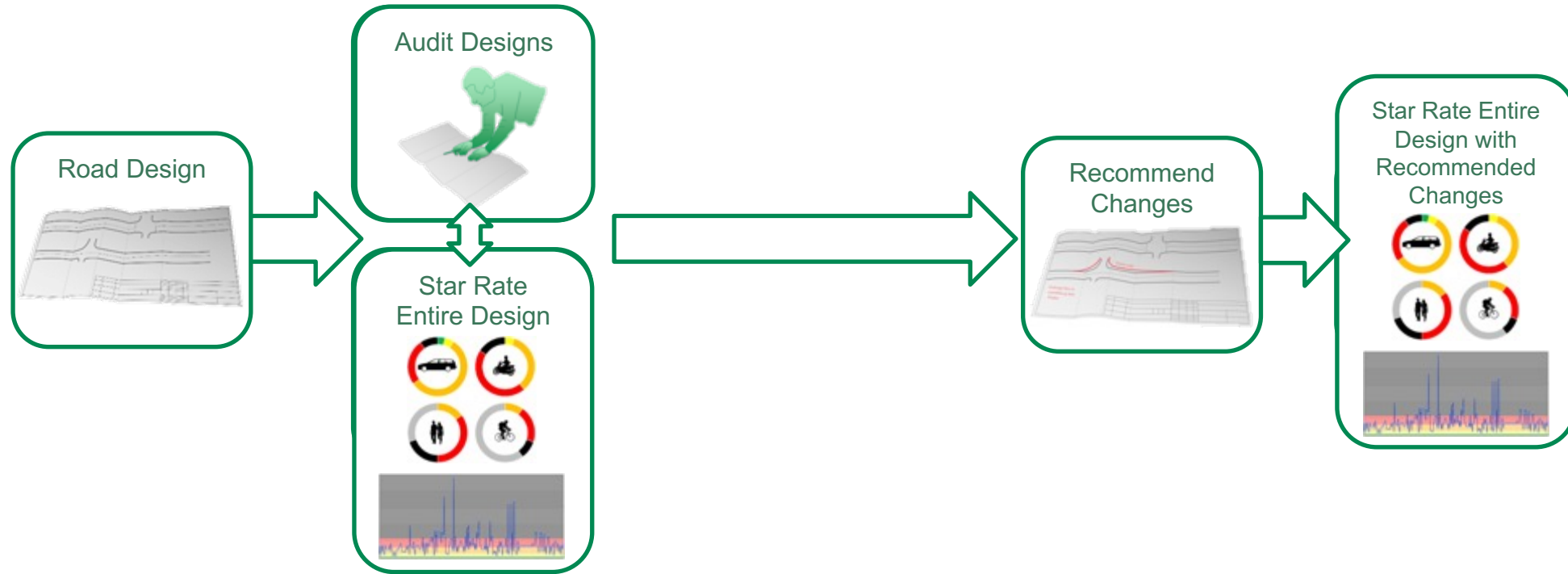
HOW? THREE FUNDAMENTAL APPROACHES

Outputs	Level 1	Level 2	Level 3
Stars for specific safety concerns and recommendations	✓	✓	✓
Stars for length of design		✓	✓
Fatality estimations			✓
Investment plan			✓
Can be used to measure against targets	Partial	✓	✓

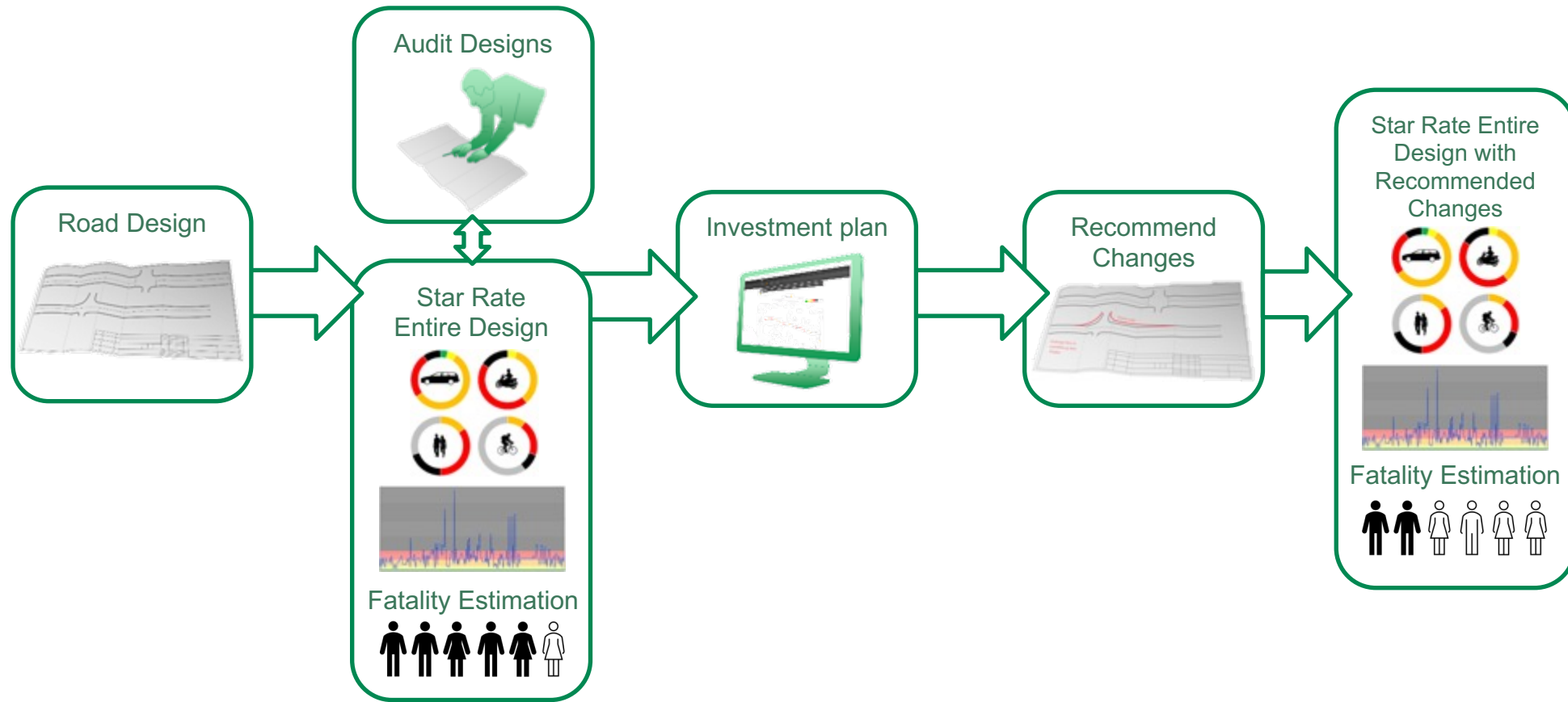
LEVEL 1



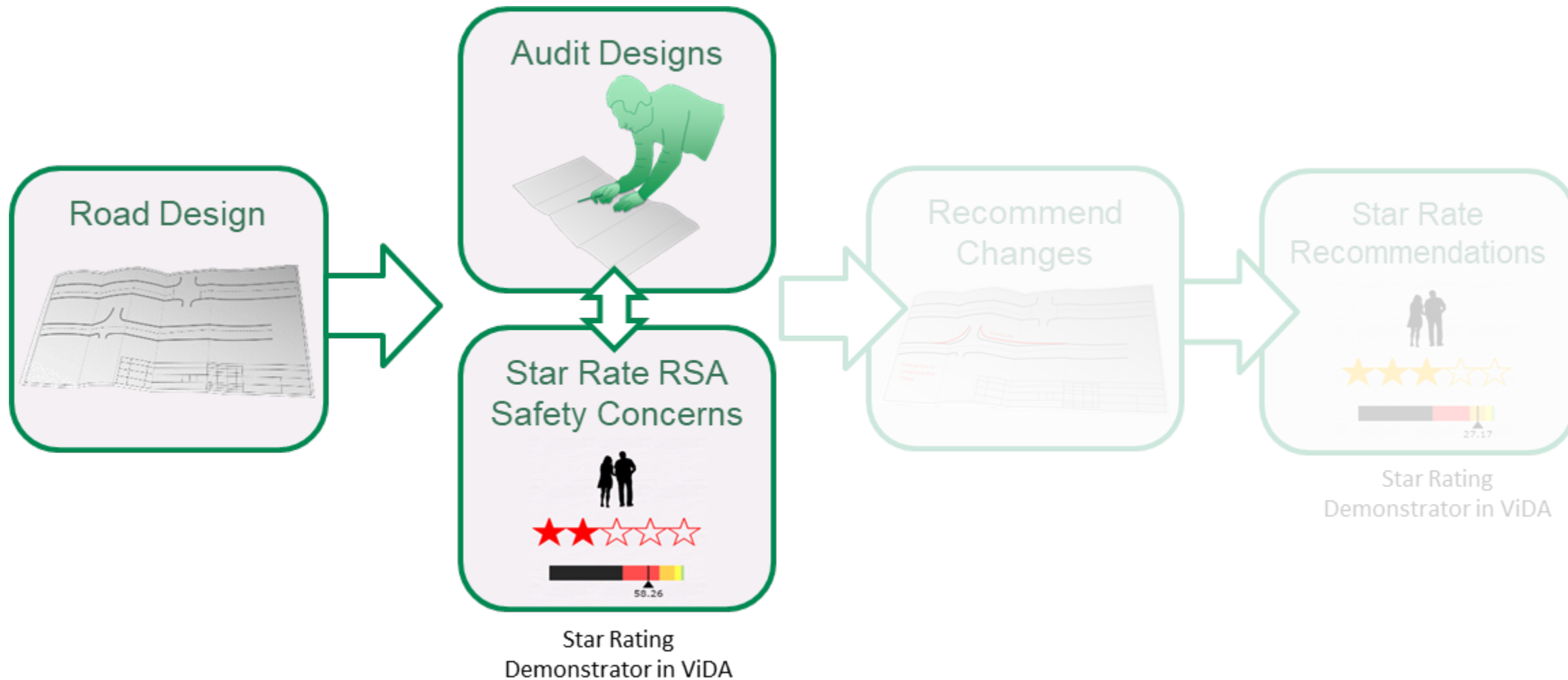
LEVEL 2



LEVEL 3

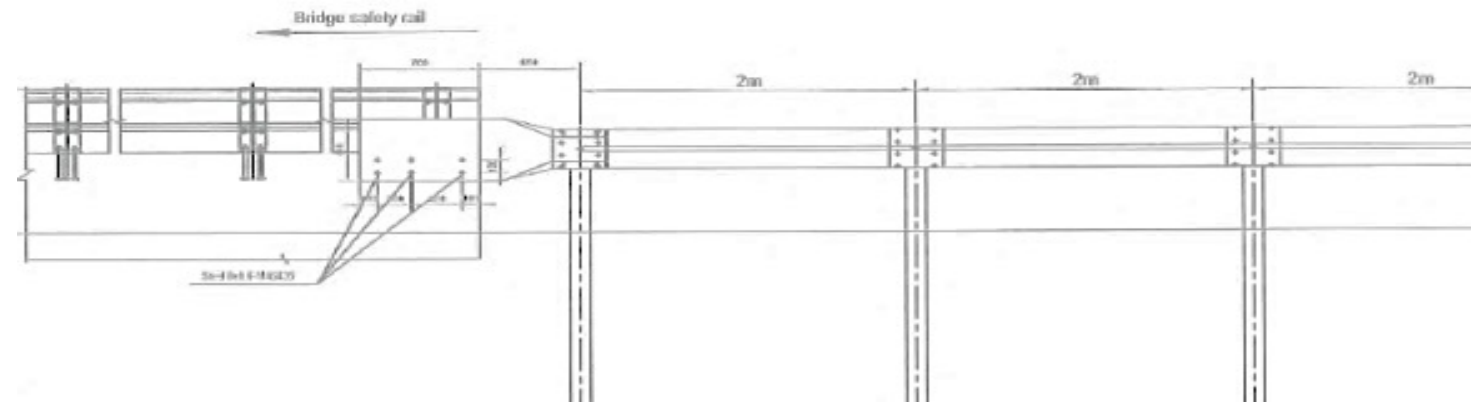
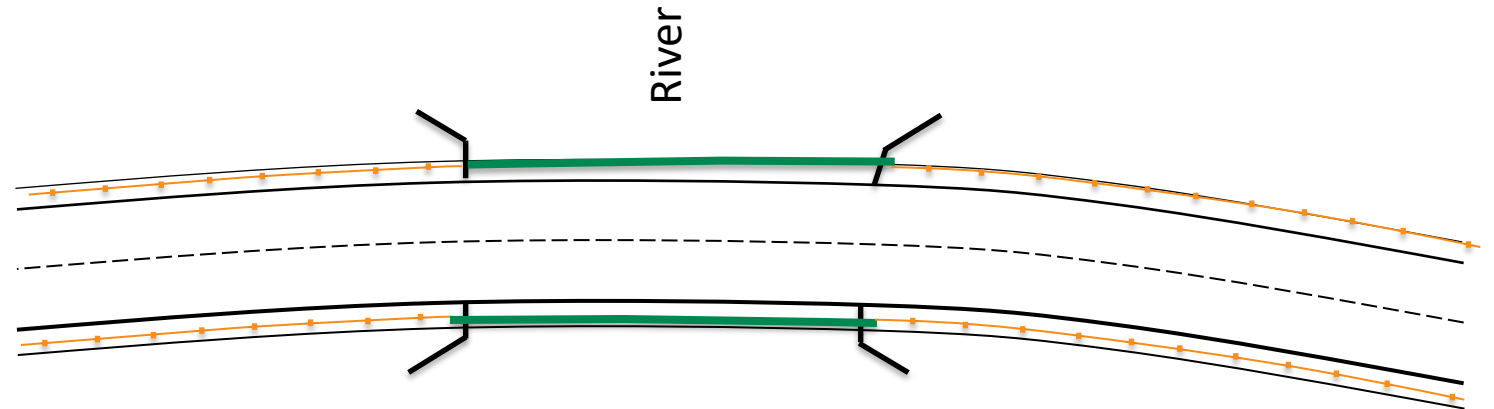


HOW? LEVEL 1 APPROACH



REVIEW THE DESIGN AND VISIT THE SITE

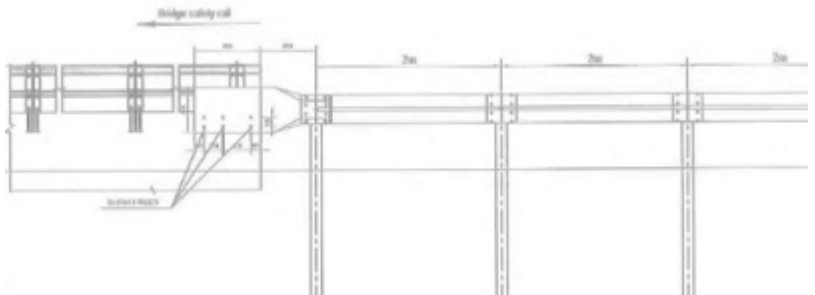
Speed Limit: 100km/h
85th percentile speed: 100km/h
AADT: 7,000
Pedestrians: 1-5 peak hour
Bicyclists: 1-5 peak hour

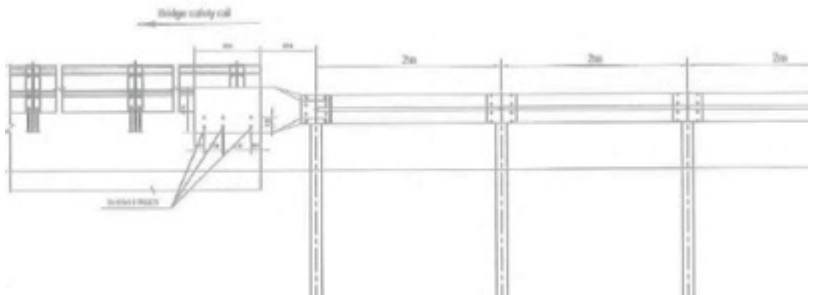


THE SAFETY CONCERN



Risk		Frequency of Possible Crash			
		Frequent	Probable	Occasional	Improbable
Severity of Possible Crash	Catastrophic	Intolerable	Intolerable	Intolerable	High
	Serious	Intolerable	Intolerable	High	Medium
	Minor	Intolerable	High	Medium	Low
	Limited	High	Medium	Low	Low

Ref	Safety Concern	Risk
3.1	<p>The transition between guardrail and bridge barrier is not adequate. In the last part of the guardrail there is no stiffening necessary for the transition to the bridge barrier. In the event of a collision, the guardrail would be more deformed than the bridge barrier, which would thus be a dangerous rigid obstacle.</p>  <p>The diagram is a technical cross-section of a bridge structure. It shows a transition from a guardrail on the left to a bridge barrier on the right. The guardrail is supported by a concrete base. The bridge barrier is supported by three vertical posts. The transition area is marked with dimensions: 400, 400, 200, 200, and 200. A label 'Bridge safety rail' points to the guardrail, and another label 'Guardrail' points to the concrete base. The drawing illustrates the structural details of the transition, including the connection between the guardrail and the bridge barrier.</p>	Medium

Ref	Safety Concern	Risk	Star Rating (Initial Design)
3.1	<p>The transition between guardrail and bridge barrier is not adequate. In the last part of the guardrail there is no stiffening necessary for the transition to the bridge barrier. In the event of a collision, the guardrail would be more deformed than the bridge barrier, which would thus be a dangerous rigid obstacle.</p> 	Medium	

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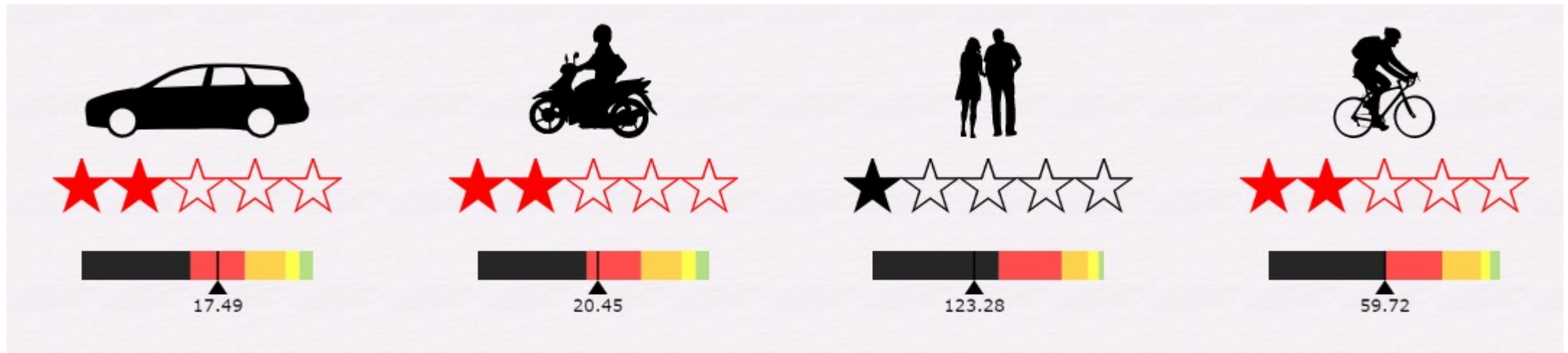
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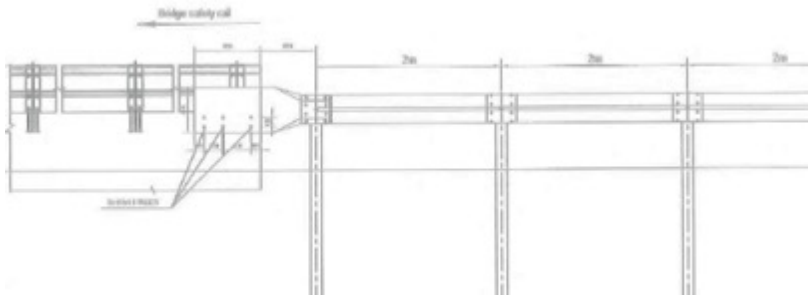




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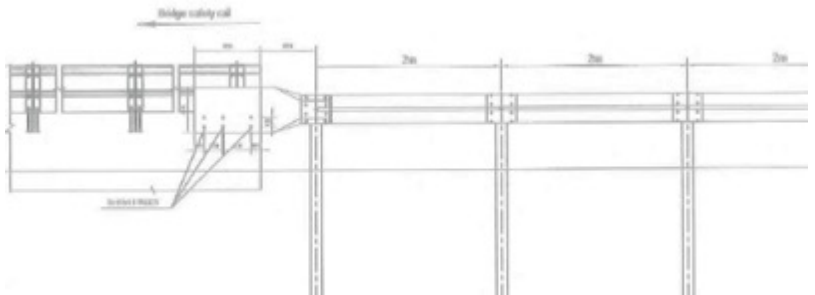





STAR RATING

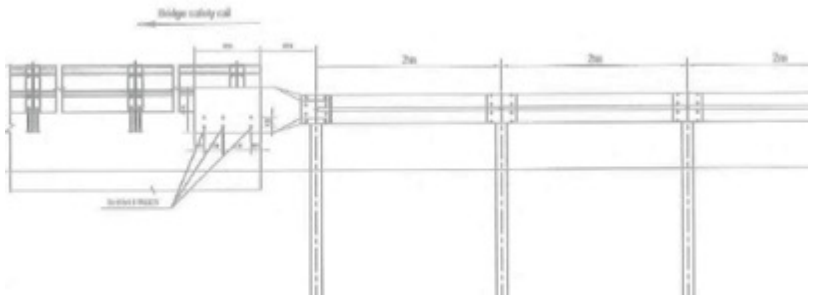




Ref	Safety Concern	Risk	Star Rating (Initial Design)
3.1	<p>The transition between guardrail and bridge barrier is not adequate. In the last part of the guardrail there is no stiffening necessary for the transition to the bridge barrier. In the event of a collision, the guardrail would be more deformed than the bridge barrier, which would thus be a dangerous rigid obstacle.</p> 	Medium	   

RECOMMENDATION



Ref	Safety Concern	Risk	Star Rating (Initial Design)	Recommendation
3.1	<p>The transition between guardrail and bridge barrier is not adequate. In the last part of the guardrail there is no stiffening necessary for the transition to the bridge barrier. In the event of a collision, the guardrail would be more deformed than the bridge barrier, which would thus be a dangerous rigid obstacle.</p> 	Medium	   	<ul style="list-style-type: none"> Ensure an appropriate transition between the two types of barriers to avoid performance changes. This can be achieved by progressive stiffening of the guardrail, for example by reducing the spacing of the posts. 

Ref	Safety Concern	Risk	Star Rating (Initial Design)	Recommendation	Star Rating (with recommendations)	Client Response
3.1	<p>The transition between guardrail and bridge barrier is not adequate. In the last part of the guardrail there is no stiffening necessary for the transition to the bridge barrier. In the event of a collision, the guardrail would be more deformed than the bridge barrier, which would thus be a dangerous rigid obstacle.</p> 	Medium		<ul style="list-style-type: none"> Ensure an appropriate transition between the two types of barriers to avoid performance changes. This can be achieved by progressive stiffening of the guardrail, for example by reducing the spacing of the posts. 		

INITIAL DESIGN



17.49



20.45



123.28



59.72

WITH RECOMMENDATION



6.93



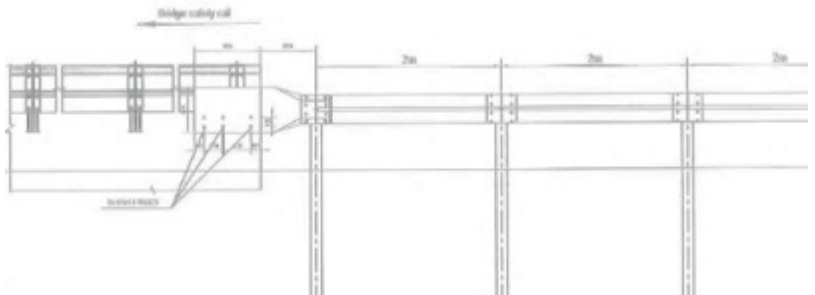



13.85



123.28

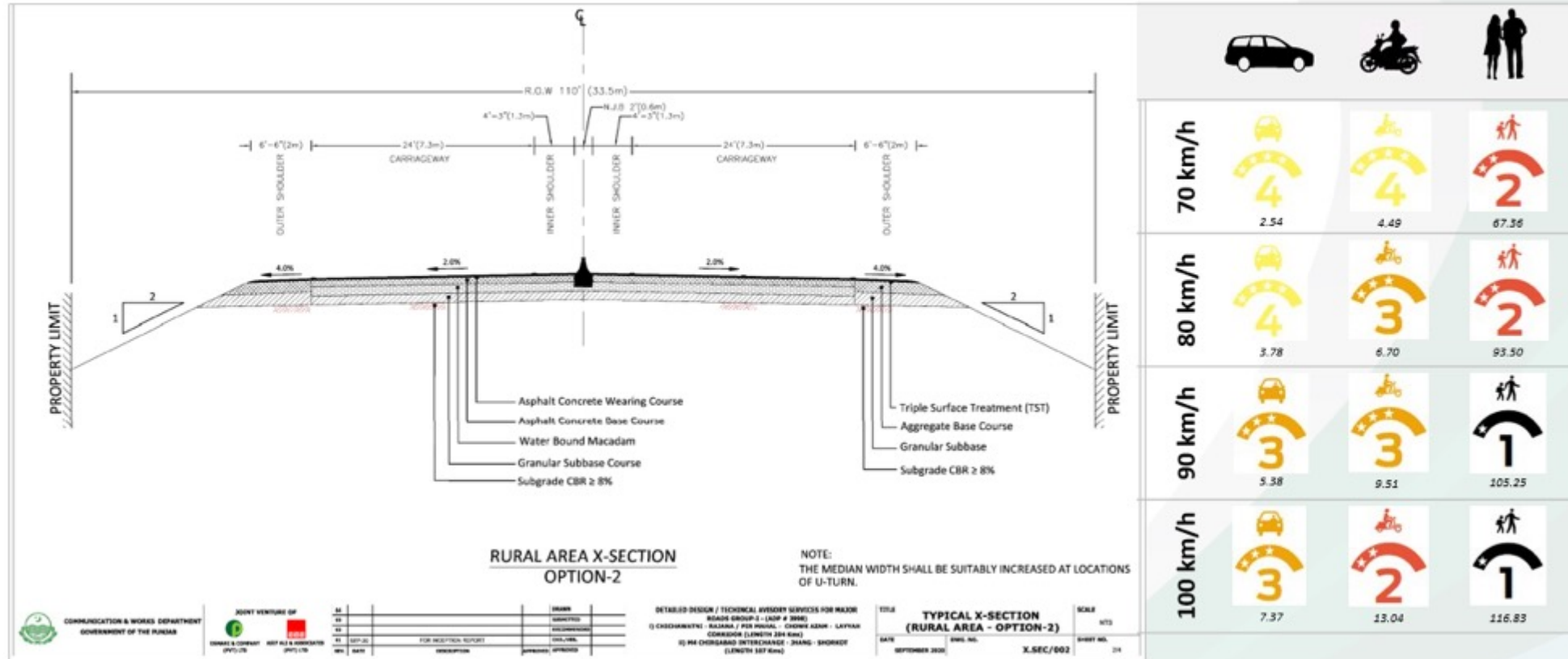


59.71

Ref	Safety Concern	Risk	Star Rating (Initial Design)	Recommendation	Star Rating (with recommendations)	Client Response
3.1	<p>The transition between guardrail and bridge barrier is not adequate. In the last part of the guardrail there is no stiffening necessary for the transition to the bridge barrier. In the event of a collision, the guardrail would be more deformed than the bridge barrier, which would thus be a dangerous rigid obstacle.</p> 	Medium		<ul style="list-style-type: none"> Ensure an appropriate transition between the two types of barriers to avoid performance changes. This can be achieved by progressive stiffening of the guardrail, for example by reducing the spacing of the posts. 		

HOW? LEVEL 1 APPROACH

Typical Cross Section for Widening on both sides with NJ Barrier in Rural Area



All results shown are for straight, mid-block sections. Adding curves and intersections will increase risk and therefore likely lower the star ratings.

QUESTIONS?



ASSIGNMENT

Using the Star Rating Demonstrator to Star Rate a road

1. Produce Star Ratings for each road user for the design.
2. Generate a recommendation to address the safety concern identified by the audit team.
3. Produce Star Ratings for each road user for the design including your recommendation.



ONLINE ACTIVITIES

- Go to this website
<https://iraptraining.moodlecloud.com/>
- Your username is your email
- Use the password provided to you
- Update your profile
- Complete the activities
- Video and presentation are available there.



The screenshot shows a Moodle course page. On the left is a navigation menu with items like SRARSA, Participants, Badges, Competencies, Grades, Home, Dashboard, Calendar, Private files, My courses, and various course modules (Intro Tz, SRE En TZ, IRAP Connect, SRAS Pt, SRAS QR, SRAS TIT, SRAS Es, SRAS En, Dev IRAP En, Dev IRAP Es, Misc). The main content area is titled "CAREC Road Safety Engineering: Star Ratings for Road Safety Audits online workshop". It features a "Welcome!" message, a video player for "STAR RATINGS FOR ROAD SAFETY AUDITS SRARSA", and text explaining the course's purpose. The text mentions that road crashes kill more than 1.35 million people annually and that the course is part of the CAREC program. It also references the 2020 UN General Assembly's Stockholm Declaration and the 2021-2030 Decade of Action for Road Safety. Logos for CAREC, ASIA-PACIFIC ROAD SAFETY OBSERVATORY, iRAP, and SAFE SYSTEM SOLUTIONS are displayed at the bottom of the page.

