



# U.S. ROAD ASSESSMENT PROGRAM (usRAP) OVERVIEW:

A Proactive Approach to Data-Driven Safety Analysis and Planning



# usRAP Overview



- 
- Program of the **Roadway Safety Foundation**, a non-profit, charitable organization dedicated to improving infrastructure safety
  - Collaboration with **iRAP**
  - Provides **software tools** to assist highway agencies in planning roadway **infrastructure projects** to **improve safety**
  - Focuses on:
    - **Reducing the risk** of fatal and serious injury crashes
    - Assuring that roadway safety improvement programs are based on **rational assessment** of crash risk.





A WORLD FREE OF HIGH-RISK ROADS – PROGRESS BY JUNE 2023



**128**  
COUNTRIES  
REACHED

**US\$ 100**  
BILLION  
OF INFRASTRUCTURE  
INVESTMENT  
MADE SAFER

**63**  
THOUSAND  
PEOPLE TRAINED

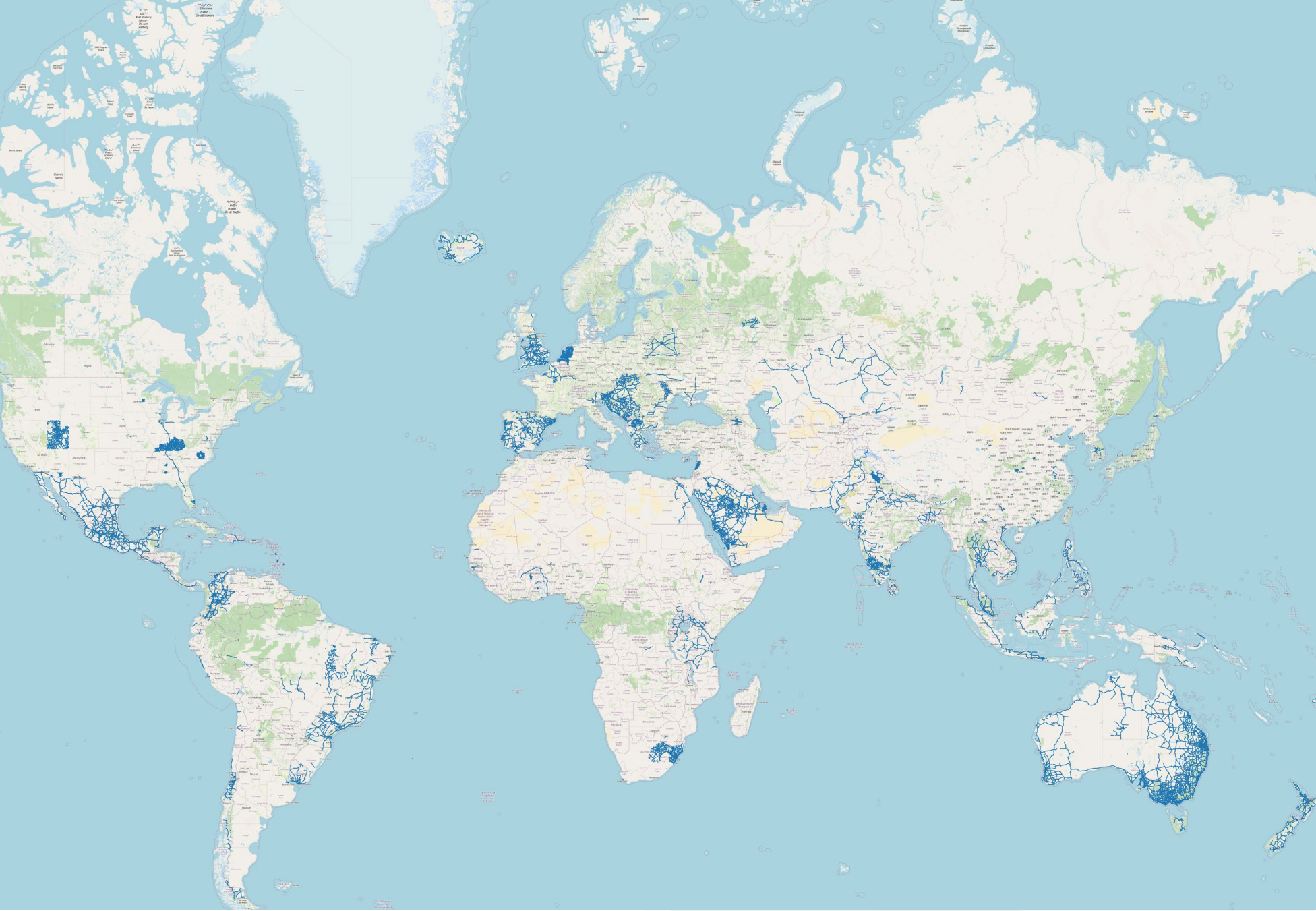
**1.5** **MM**  
ROADS AND  
DESIGNS  
STAR RATED

**1.8** **MM**  
KM  
RISK MAPPED

**1,229**  
SCHOOLS STAR RATED  
USING SR4S IN  
67 COUNTRIES

**6.6 MILLION**  
KM  
OF ROAD IN VIDA

- EuroRAP
- AusRAP
- usRAP
- KiwiRAP
- ChinaRAP
- IndiaRAP
- BrazilRAP
- SARAP
- ThaiRAP
- MyRAP
- TanRAP
- UNITED KINGDOM RAP



# usRAP Team

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Roadway Safety Foundation



Iowa State University (Technical Lead)



Harwood Road Safety

University of Kentucky



# What is usRAP's approach?

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usRAP supports a **systemic approach** to safety management, helping agencies focus **proactively** on **improving** locations with the **highest potential** for crash reduction. As a result:

- infrastructure **improvement** needs can be identified **without waiting** for crashes to happen
- safety improvement **resources** can focus on **long-term** improvement needs, not short-term crash patterns

# usRAP Data-driven Safety Analysis

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- usRAP can be applied to **ANY** roadway or road network
- **Complements**, but does not replace, engineering judgment and local expertise
- **Planning** tool, not a design tool
- Helps zero-in on **cost-effective** projects quickly

# usRAP Data-driven Safety Analysis (cont.)

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- Especially useful in situations where robust crash data are **lacking**, or on networks with such **low VMT** that actionable crash patterns are difficult to decipher
- Acknowledged by **FHWA** as a valid tool for performing data-driven safety analysis
- Allows highway officials to take action **NOW**, rather than waiting for crashes, deaths, and serious injuries to occur

# What is ViDA?

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- Uses **site characteristics** data and **crash prediction models** to identify infrastructure **needs** before crashes happen
- Identifies **improvement locations** and **countermeasures** so **engineering studies** can focus on the highest priority, highest payoff locations

# What is ViDA? (cont.)

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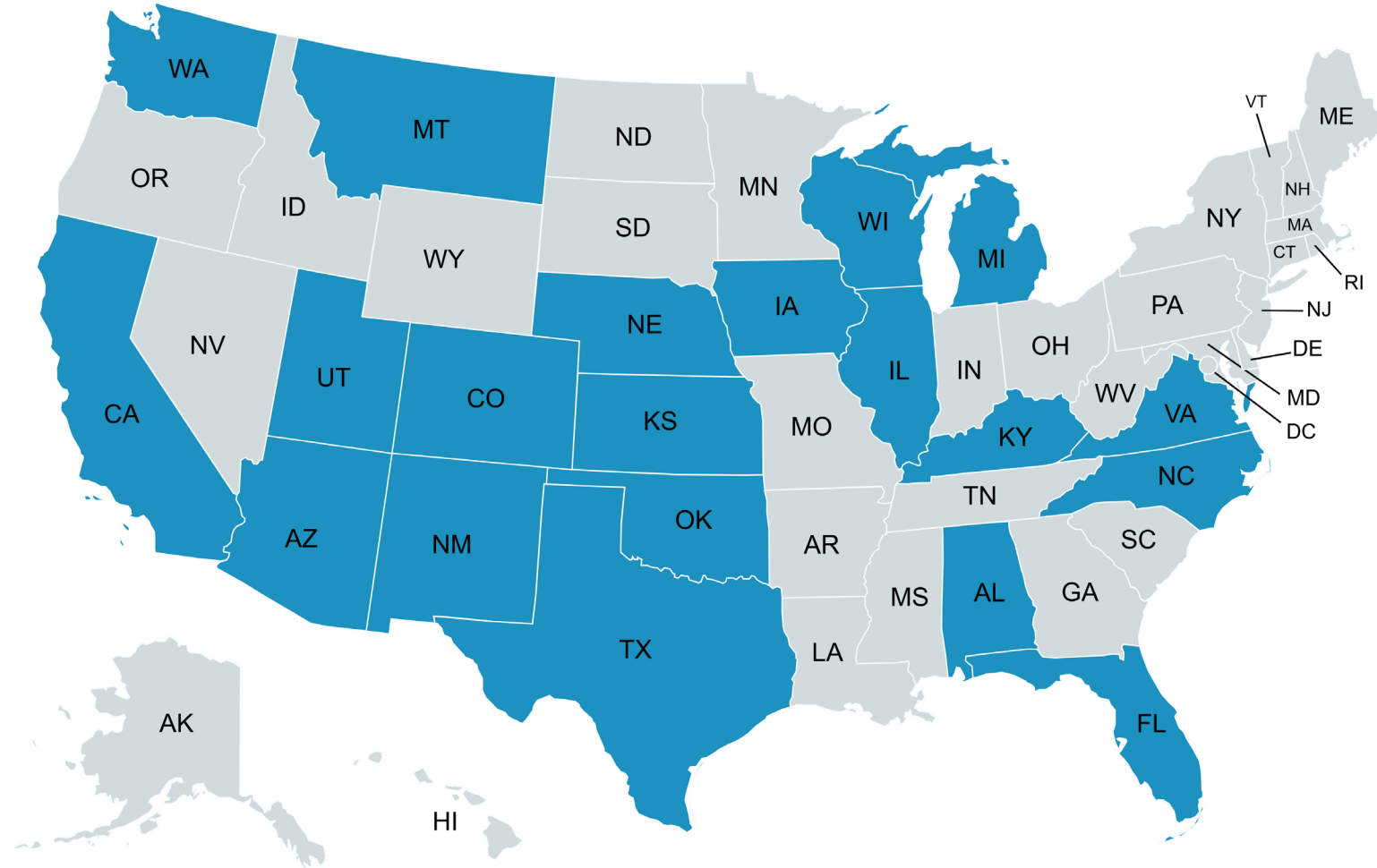
- **Detailed site-specific** crash data are **NOT** needed
- **Network-wide** crash data are useful for **calibration**
- User can customize analyses with locally preferred data on:
  - countermeasure **unit costs**
  - countermeasure **service life**
  - fatality and serious **injury costs**
  - minimum **benefit-cost** ratio

# Why use ViDA software?

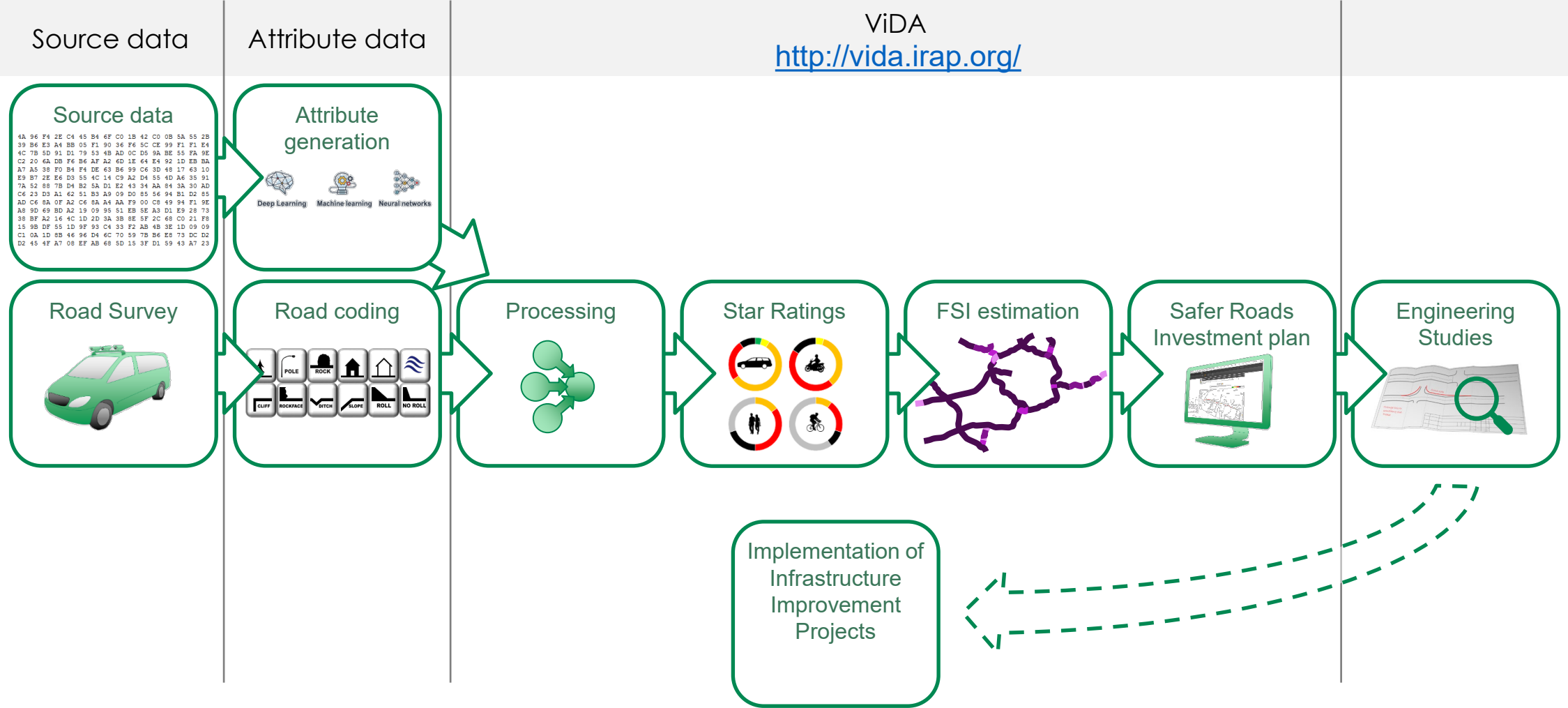
<http://vida.irap.org>

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- ViDA is uniquely valuable for **systemic safety** planning
  - ViDA allows you to **expand** the scope of study efficiently in terms of time and cost
  - ViDA software is available **free** of charge, and with proper training can be used by any highway agency or consultants
  - Technical **support** to ViDA users is provided **free** of charge by the usRAP team

# Where has ViDA software been applied?



# RAP Process

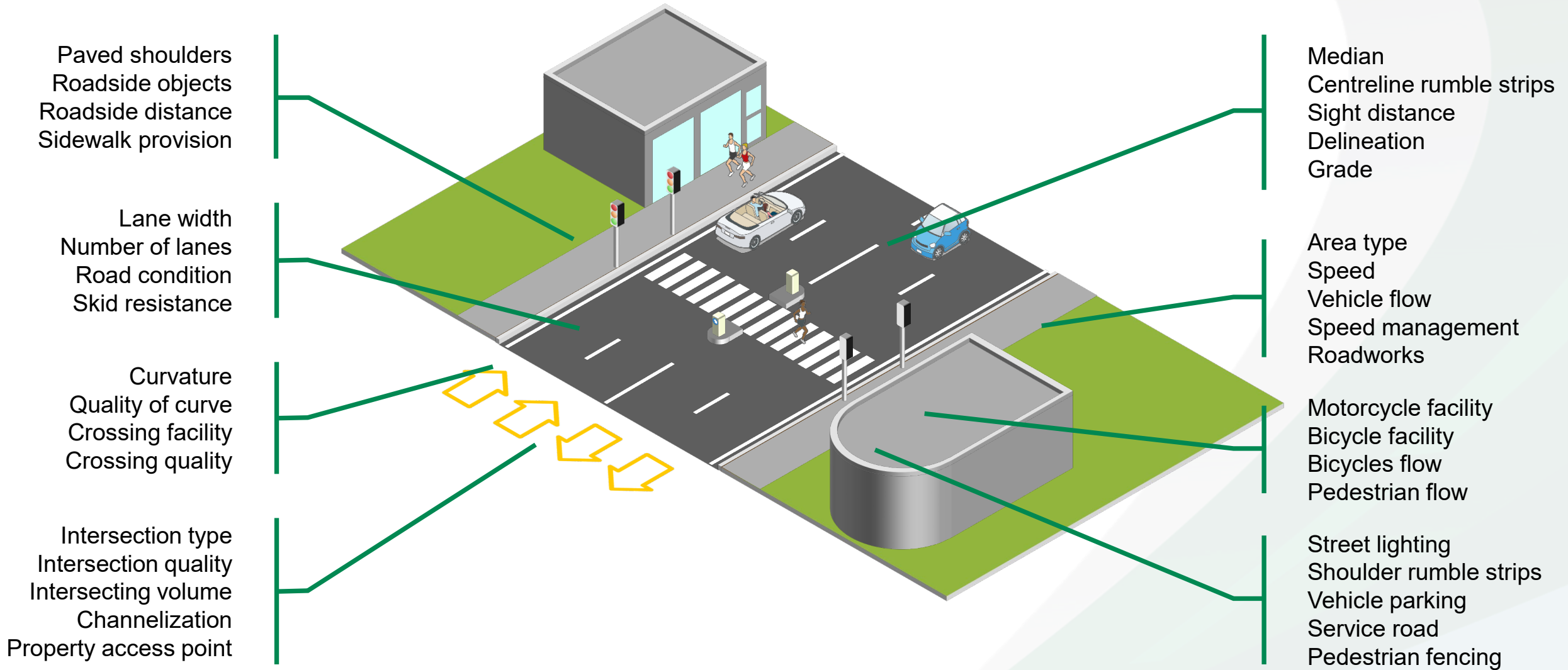


# Star Ratings Input Data

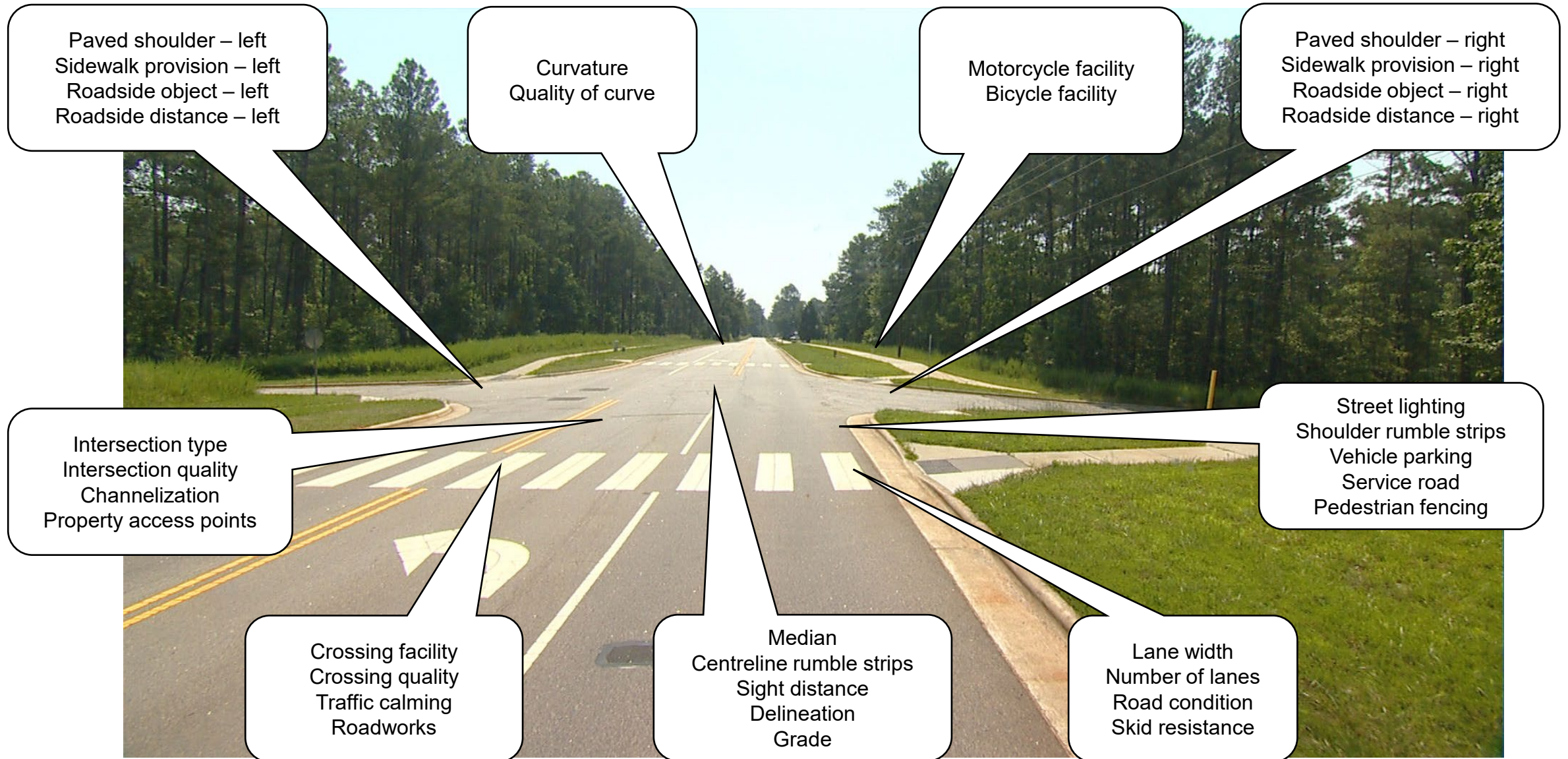
- Key safety-related **roadway characteristics**, including quality
- Key **operational** and **traffic control** characteristics
  - Traffic volume
  - Motorcycle percentage
  - Pedestrian flow
  - Bicycle flow
  - Intersecting road volume
  - Speed limit
  - Mean traffic speed
  - 85th percentile traffic speed



# Star Ratings - Road Features



# Star Ratings - Road Features



# What results does ViDA provide?

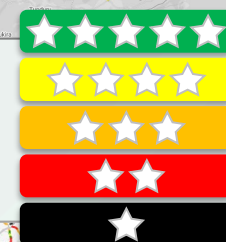
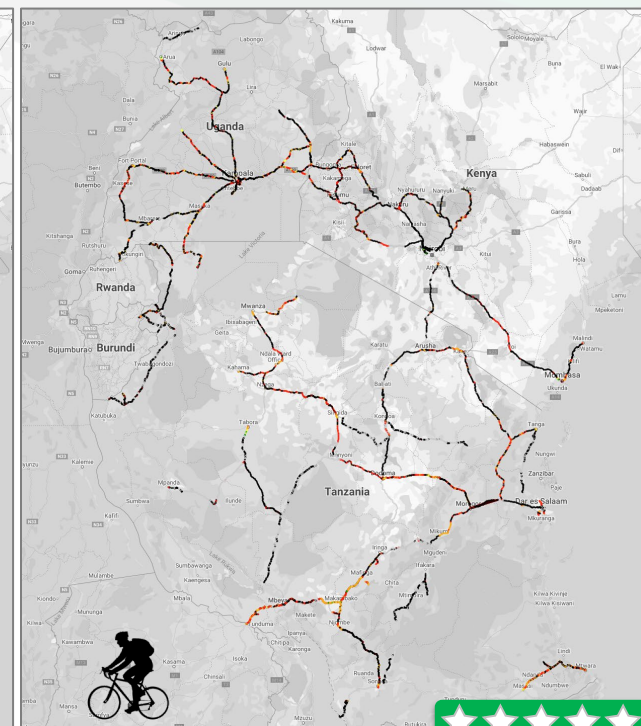
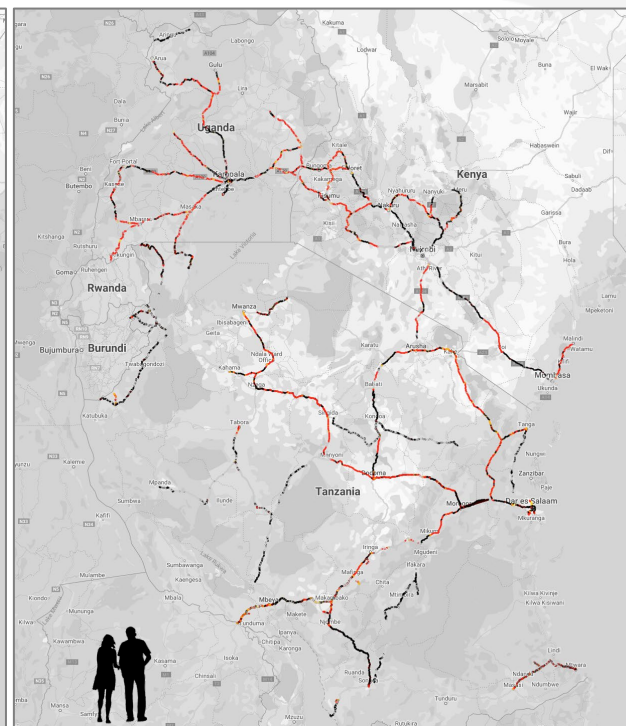
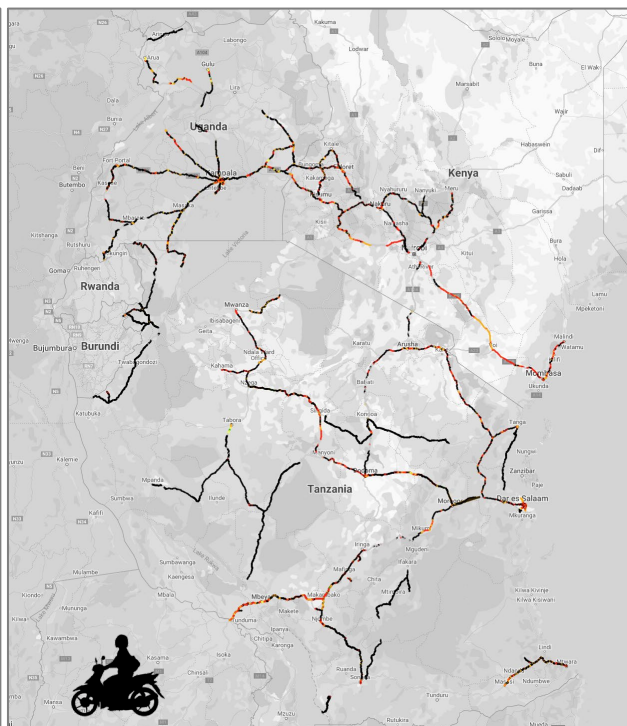
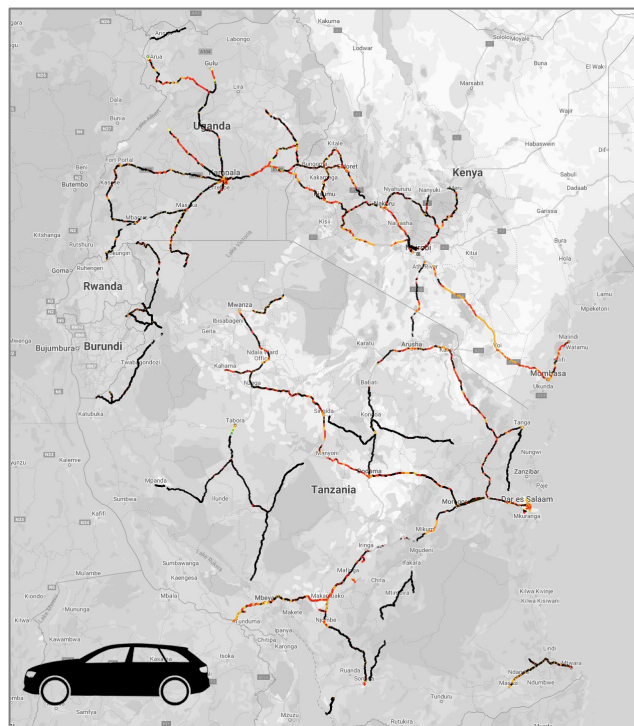
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- **Estimated** fatality and serious injury **frequencies** for each 327-ft (100-m) road segment [download file]
- **Star rating** tables, maps and download files
- **Safer Roads Investment Plan** tables, maps and download files
- Maps showing fatality and serious injury **reduction** per unit length
- Sortable **countermeasure data** (locations, benefits, costs, benefit-cost ratios) [download file]

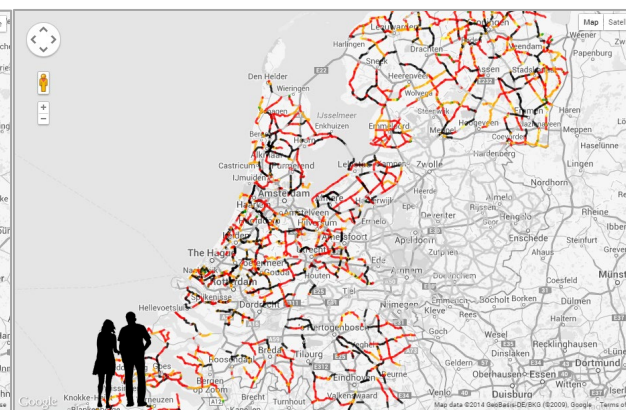
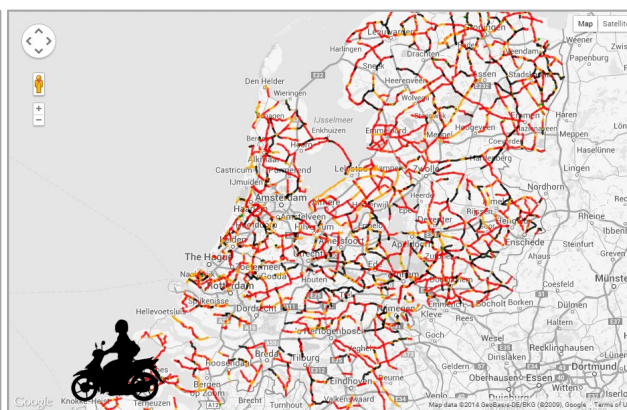
# What are Star Ratings?

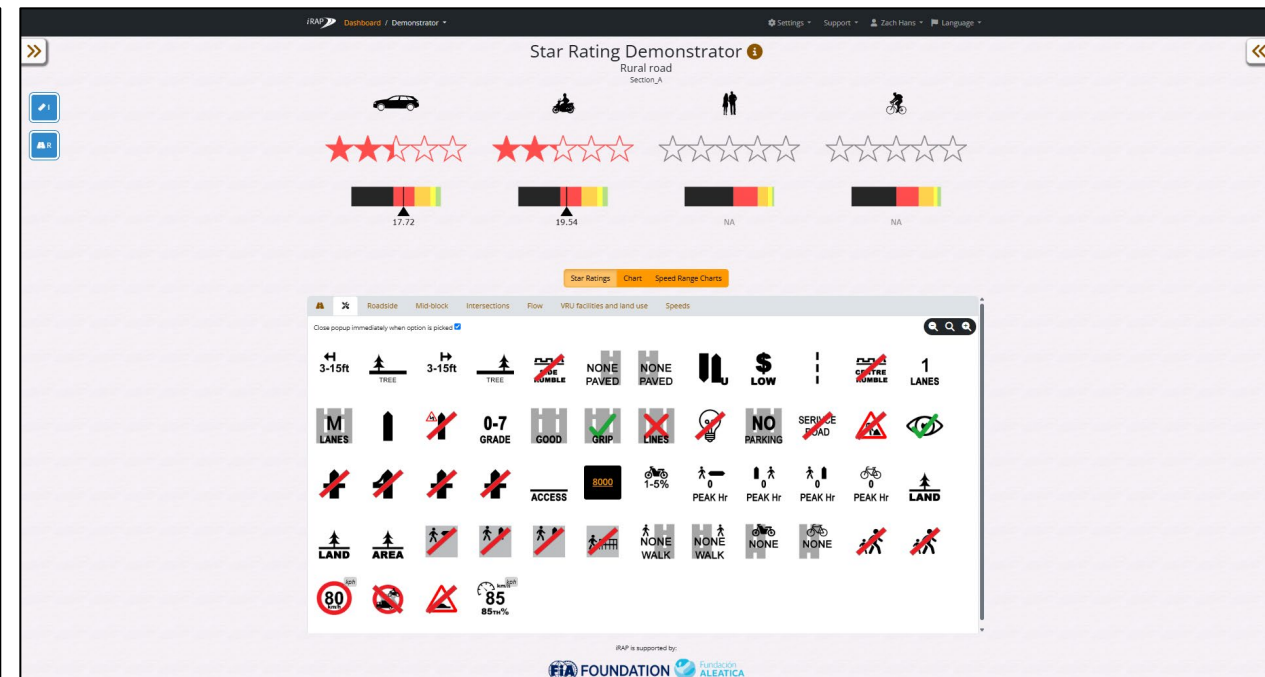
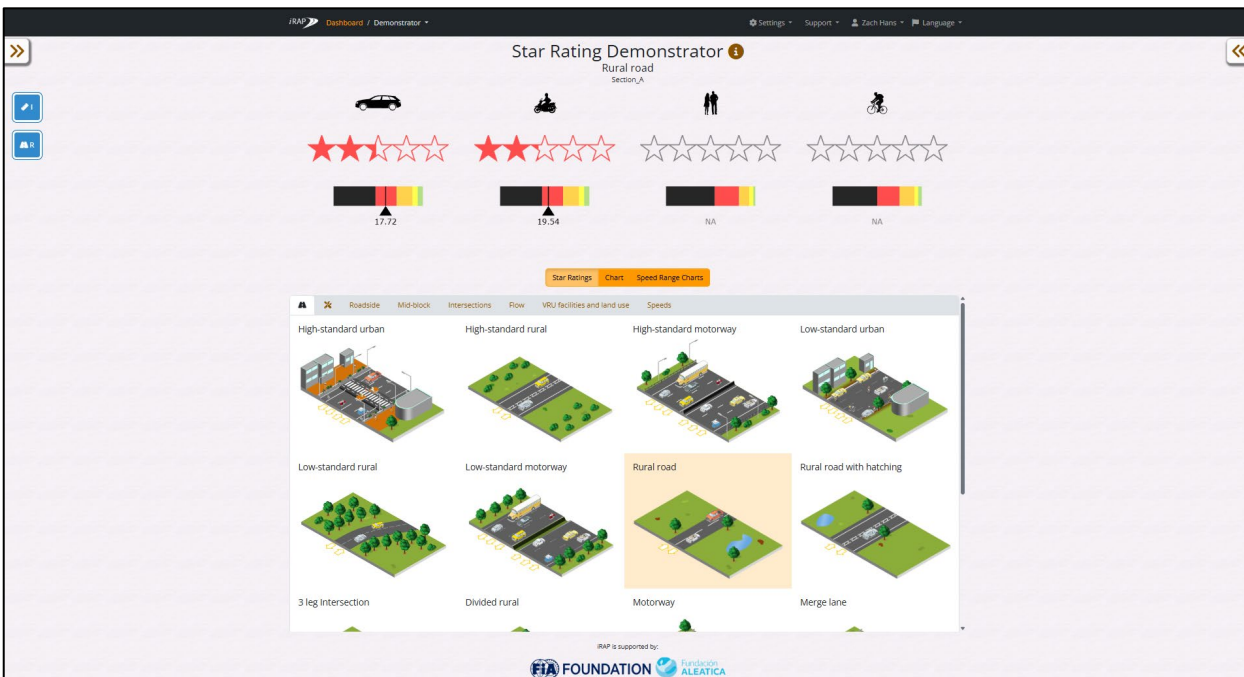
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- Star ratings are assigned based on **presence** or **absence** of **road design** and **traffic control features** related to safety
- Star ratings are a first step toward determining:
  - **safety performance** of a roadway segment
  - **effects** of roadway characteristics on safety



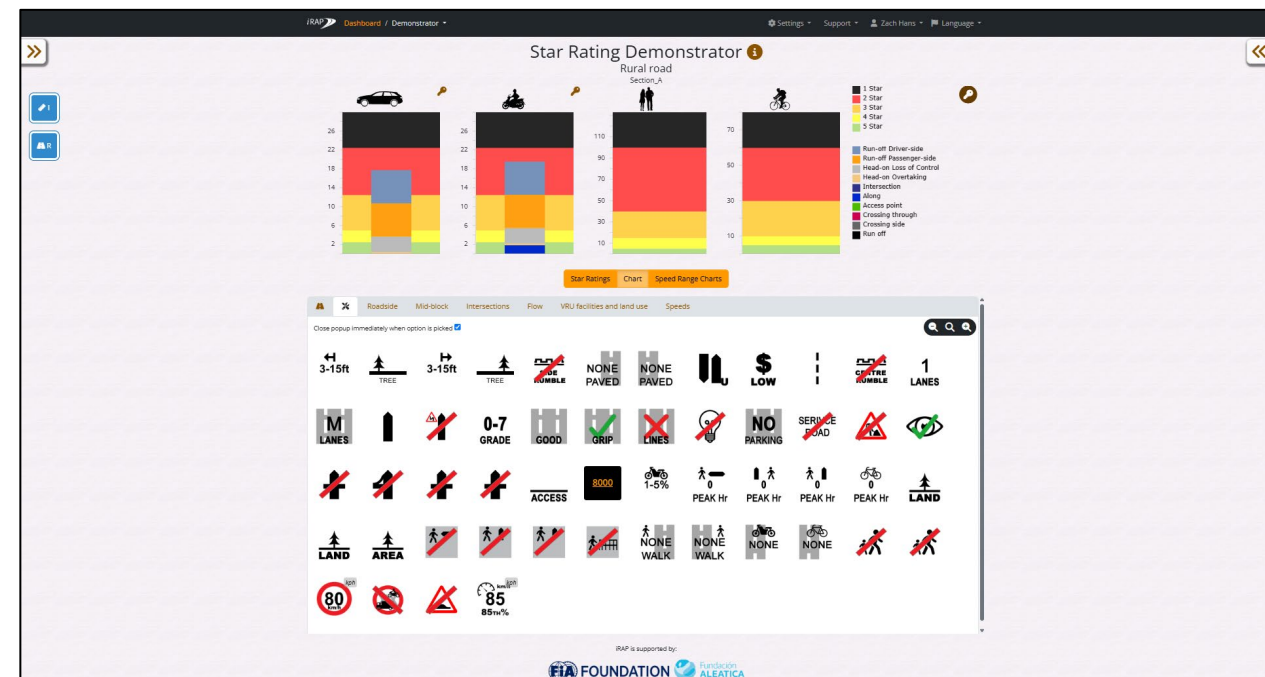
# Road User Specific Maps





# Star Rating Demonstrator

<https://demonstrator.vida.irap.org/>



# Fatal & Serious Injury Estimation



# Safer Roads Investment Plans

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Safer Roads Investment Plans are developed from **road attributes** that are coded and uploaded to ViDA to develop star ratings

- **90** proven countermeasures
- **300+** engineering trigger sets



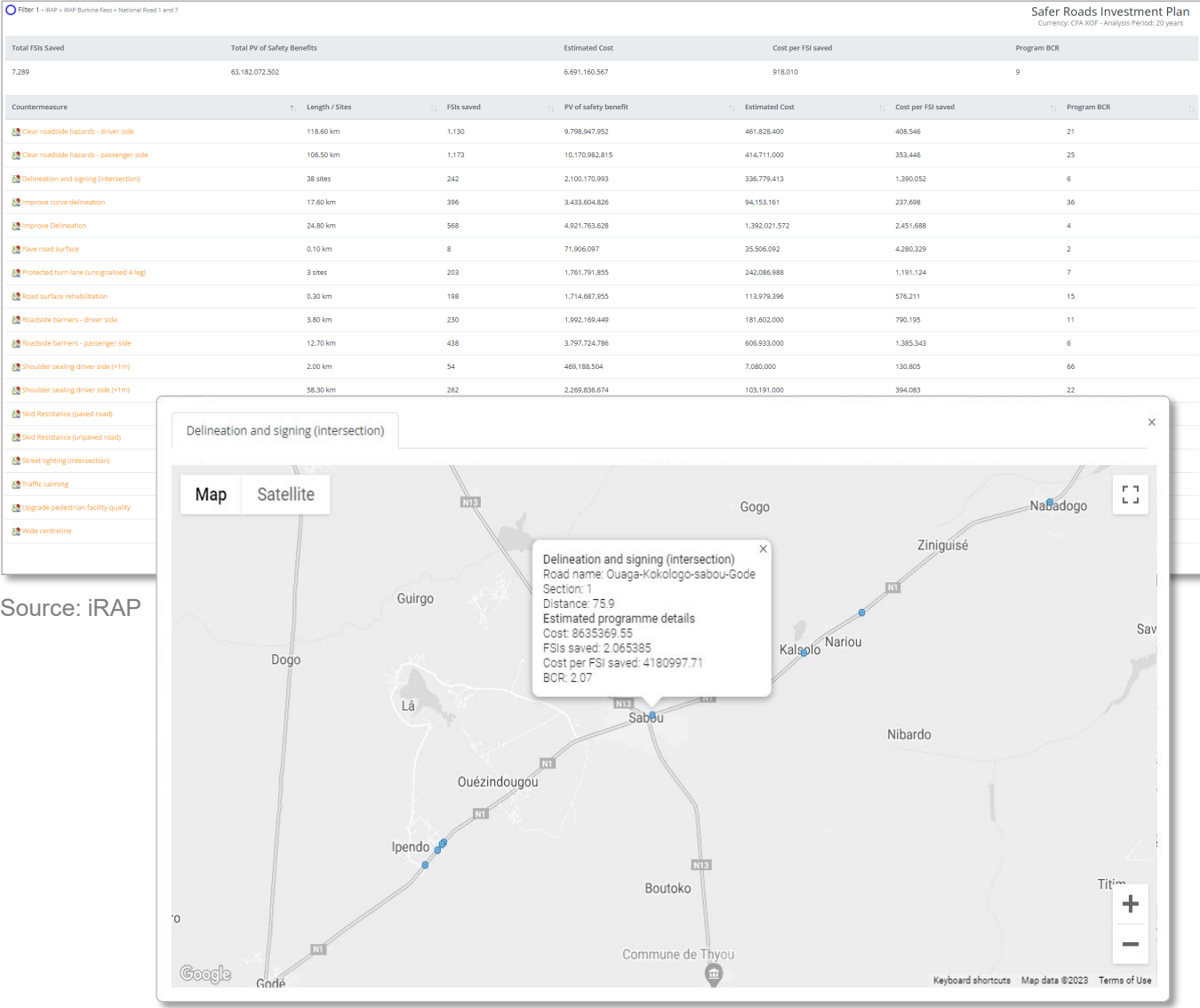
# What does a Safer Roads Investment Plan include?

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- Specific **countermeasures** to be implemented
- Specific implementation **locations**
- Quantitative **cost estimates**
- Quantitative **safety benefits** (in crashes reduced and dollars)
- **Cost-effectiveness** measures
- **Benefit-cost ratios**. All countermeasures meet a minimum benefit-cost ratio specified by the user

The **next step** in implementing the plan should be traditional site-specific **engineering studies** of proposed improvements

# Safer Roads Investment Plan Examples



Source: iRAP

Currency: \$ USD - Analysis Period: 20 years

Total FSI's Saved	Total PV of Safety Benefits	Estimated Cost	Cost per FSI saved	Program BCR
672	609,684,480	46,003,356	68,412	13

Countermeasure	Length / Sites	FSIs saved	PV of safety benefit	Estimated Cost	Cost per FSI saved	Program BCR
Clear roadside hazards - right side	362.60 km	184	166,504,731	6,201,030	33,766	27
Clear roadside hazards - left side	351.80 km	182	164,930,112	5,979,660	32,872	28
Central median barrier (no duplication)	16.30 km	74	67,403,837	7,464,971	100,413	9
Sidewalk provision left side (adjacent to road)	53.00 km	46	41,261,402	4,771,410	104,846	9
Skid resistance (paved road)	7.80 km	38	34,045,196	2,963,484	78,921	11
Roadside barriers - right side	16.10 km	36	32,281,596	4,817,100	135,294	7
Roadside barriers - left side	13.40 km	30	26,826,981	3,941,550	133,212	7
Road surface rehabilitation	18.60 km	18	16,661,060	2,077,178	113,037	8
Signalise intersection (4-leg)	7 sites	11	10,085,087	840,000	75,518	12

Min BCR	K & A Crashes Saved (20 yr)	Present Value of Benefits (\$ M)	Cost (20 yr) (\$ M)	Program BCR
1	317	238.3	90.9	2.6
2	252	189.8	42.6	4.5
3	206	154.8	28.8	5.4
4	160	120.1	18.8	6.4
5	114	85.8	10.8	8.0

Example Alternate Investment Levels

# Software Licensing/Accreditation

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- Application of usRAP protocols and software has **no cost** to users but requires that users be **accredited**
- **Highway agencies** can be **accredited** to perform usRAP studies for themselves through **training and experience**
- **Universities, research agencies** and **consultants** can become **accredited** to perform usRAP studies for highway agencies through **training and experience**

# usRAP Online Training Series

Training courses available at

**Iowa State University**

Move to ISU Extension and Outreach in progress.

- **usRAP Data-Driven Safety Analysis and Planning**

<https://shop.iastate.edu/extension/more-resources/affiliates/u.s.-road-assessment-program-usrap/usrap1.html>

- **usRAP Coding: A Complete Course on Data Preparation**

<https://shop.iastate.edu/extension/more-resources/affiliates/u.s.-road-assessment-program-usrap/usrap2.html>

- **ViDA Software Use Course** – detailed procedures for applying ViDA software (contact usRAP team)

## usRAP Online Training Series

The United States Road Assessment Program (usRAP) offers highway engineers, safety planners, and transportation officials unique and userfriendly tools for evaluating the safety of their road networks and directing limited resources for improvements to the areas where they will have the most impact.



"Find new ways of saving lives in your community and helping drive the nation along the Road to Zero Fatalities."

Bruce Hamilton, Director of Safety and Research Programs at the Roadway Safety Foundation



usRAP Data-Driven Safety Analysis and Planning



Register Now

usRAP Data Coding: A Complete Course on Data Preparation



Register Now

# Contact Information for usRAP

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## **Federal Highway Administration**

Has highlighted usRAP's protocols as data-driven safety tools in Every Day Counts 3 and 4

<http://safety.fhwa.dot.gov>

## **Roadway Safety Foundation**

Working with FHWA to encourage use of usRAP's protocols and provide technical support to users

Bruce Hamilton, Executive Director

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## **Institute for Transportation, Iowa State University**

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# Thank You!