

# SENSoR project and consultation on EuroRAP results in Croatia

Olivera Djordjevic, Make Roads Safe Hellas (MRSH) and  
Marko Ševrović, Faculty of Transport and Traffic Sciences

# This presentation

- The SENSoR project in South East Europe
- EuroRAP methodology – brief introduction
- Presentation and consultation on preliminary SENSoR EuroRAP results in Croatia
- Potential improvements areas
- Discussion

≡ MAKE ROADS SAFE  
HELLAS

# Make Roads Safe Hellas

**Make Roads Safe Hellas** is a new non-profit organization founded in 2010, Chania-Crete.

- Member of the Global Make Roads Safe campaign;
- Signatory of European Road Safety Charter;
- Member of EuroRAP;
- The Lead Partner of SENSOR Project.

≡ **MAKE ROADS SAFE**  
The Campaign for Global Road Safety



# SENSoR- South East Neighbourhood Safe Routes

- Albania
- Bosnia & Herzegovina
- Bulgaria
- Croatia
- FYR Macedonia
- Greece
- Hungary
- Moldova
- Montenegro
- Romania
- Serbia
- Slovakia
- Slovenia
- Ukraine



# SENSoR Key Data

Project Budget: **1,452,126.50  
EUR**

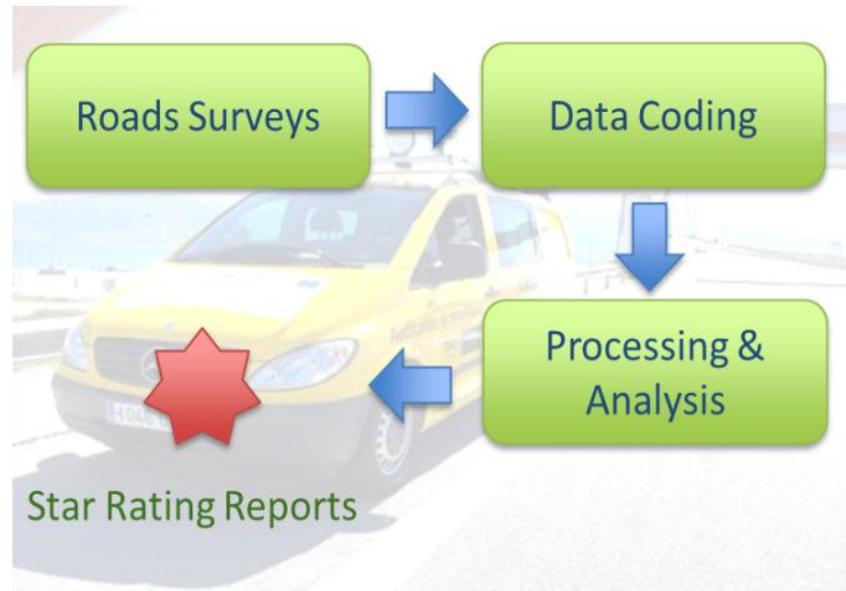
Project Duration: **24 months**

Project end: **Sept. 2014**

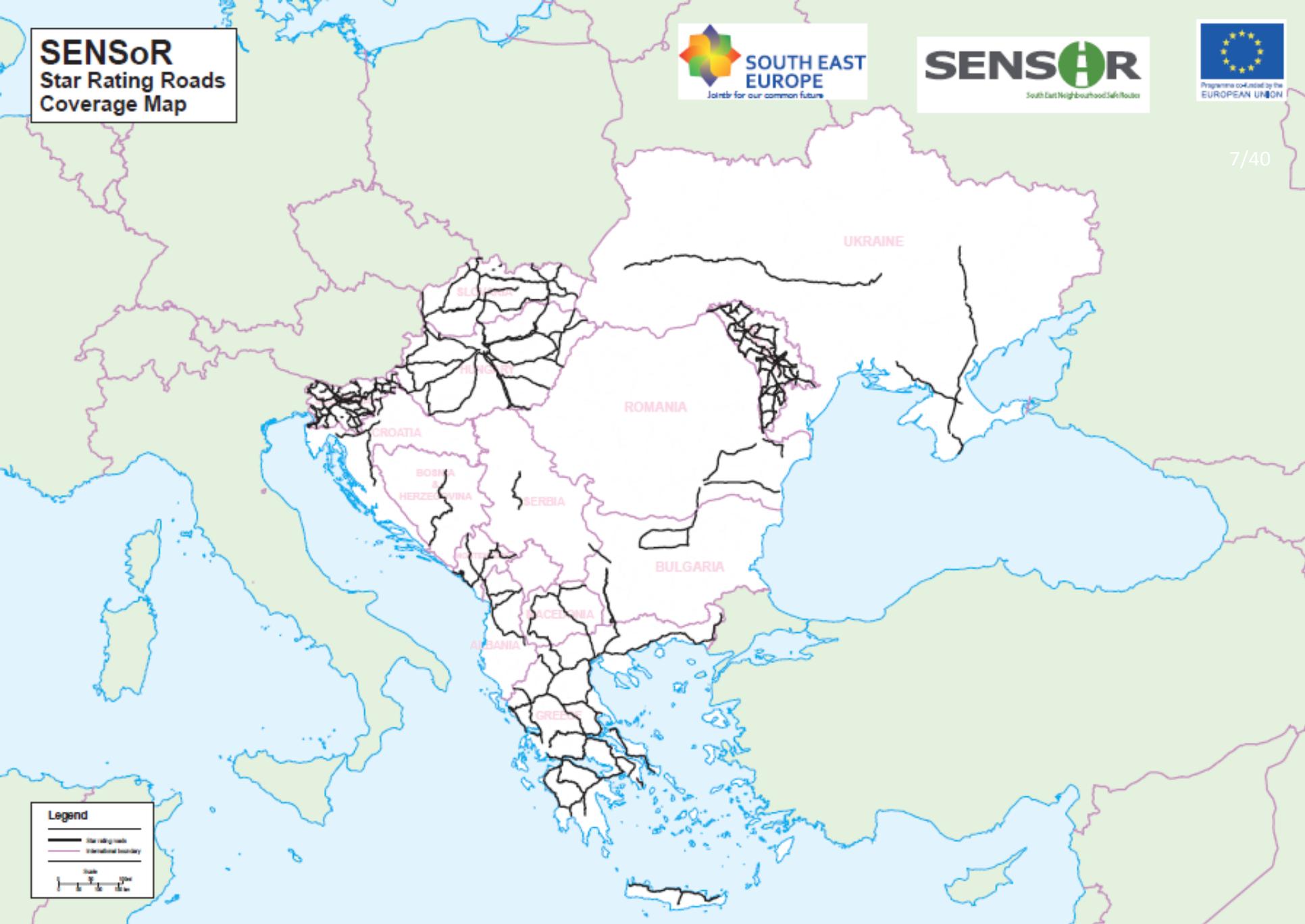
# Road Survey & Star Rating targets



Country	Coverage	Surveys
Greece	3.500km	✓
Slovakia	2.500km	✓
Slovenia	3.150km	✓
Hungary	3.000km	✓
Bulgaria	620km	✓
Romania	540km	✓
Serbia	138km	✓
FYROM	548km	✓
Bosnia & Herzegovina	352km	✓
Montenegro	555km	✓
Albania	533km	✓
Croatia	481km	✓
<b>Total</b>	<b>15.917km</b>	



# SENSoR Star Rating Roads Coverage Map



**Legend**

- Star rating roads
- International boundary

Scale  
0 10 20 30 km

# Communicating our work

*We send our messages...*

National and local politicians and stakeholders recognise and support SENSOR as:

*....an important project which is being carried out to SAVE LIVES!*





## Press Releases

[www.sensorproject.eu](http://www.sensorproject.eu)

Follow SENSOR activities at the web interactive map



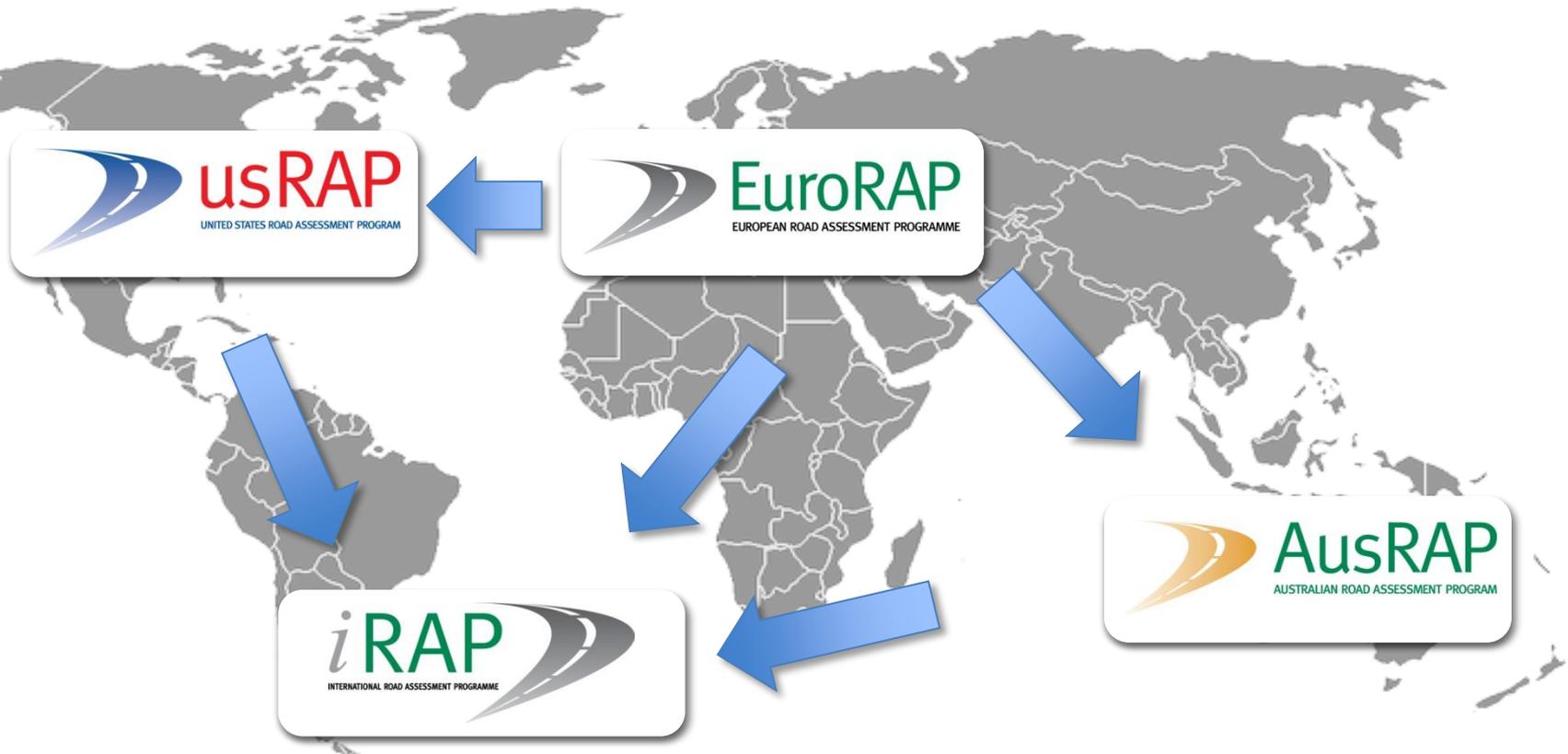
## Achaia TV: Newscast



# “How do we score what we score?” the Star Rating methodology

# RAP – History

- **RAP – Road Assessment Programme**
- **EuroRAP AISBL**
  - 2002 – Registered in Brussels as an international **not-for-profit** organisation, building on work since 1999
- **International Road Assessment Programme (iRAP)**
  - Established in 2006
  - Registered as **UK charity** in 2010
  - Umbrella organisation for developed-country RAPs
  - Develop tools for low and middle income countries



# RAP on a global scale – active in 90+ countries



# EuroRAP's core activity

Spatial description of risk, and development of infrastructure-related investment packages.

- Where and how are people killed?
- How do we match countermeasures to needs?
- What are the costs and benefits?



- Roads given 1-5 stars dependent upon crash/injury risk
- Built on same principle as as in NCAP car crash tests



The screenshot shows the ADAC website interface for a car crash test. The car is a silver Hyundai i30. The results are as follows:

RATING	SCORE	Details
ADULT OCCUPANT ★★★★★	34	Front: 13 Side: 15.6 Seatbelt reminder: 3 Pole: 2
CHILD OCCUPANT ★★★★☆	38	
PEDESTRIAN ★★☆☆☆	14	

Navigation: HOME | OUR TESTS | RESULTS | ABOUT US | PRESS | FAQ

Buttons: Pictures | Films

**EuroRAP Star Rating for roads measures “...the extent to which the road infrastructure determines the likelihood of an accident and protects the road users from being severely injured or killed once an accident occurs”**

# Star Rating the safety of roads

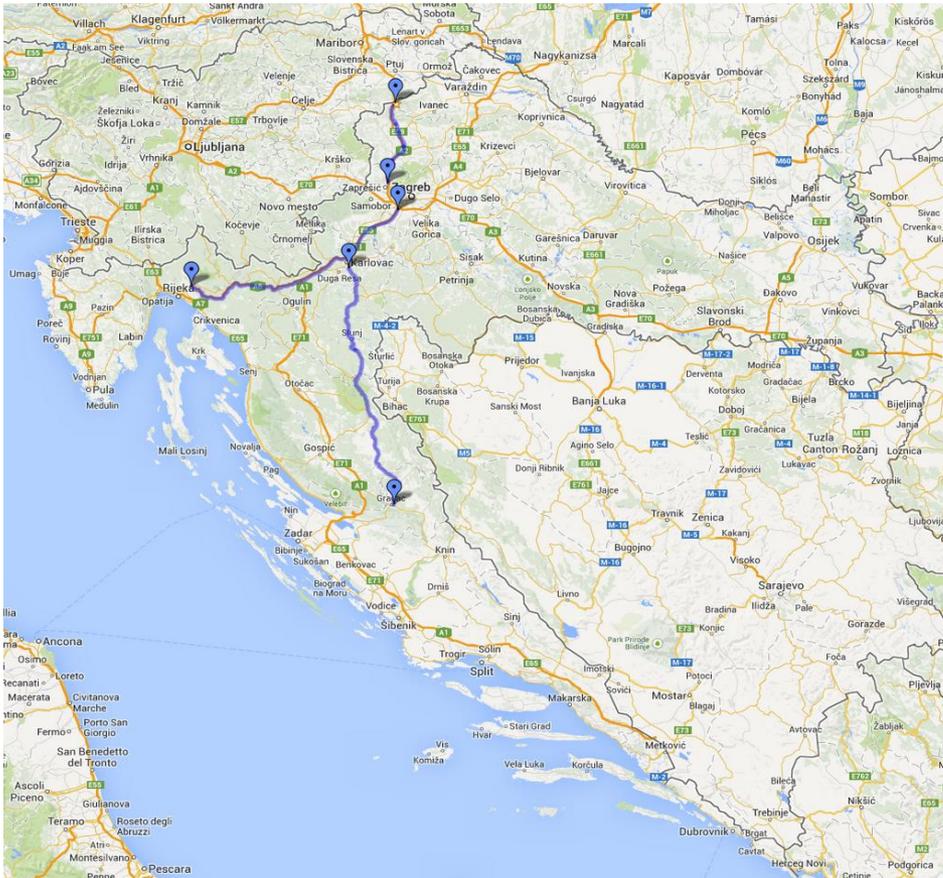
- Based upon
  - Road features – 40+ features known to affect likelihood and severity of injury
  - Head-on, run-off, intersection crashes (for cars)
  - The speed at which the road is operated at
  - Car occupants, motorcyclists, pedestrians, bicyclists

# “Results for Consultation with Stakeholders - CROATIA”





# CROATIA - RPS Survey & Coding of 481 km of road network



- **D1 (state road – single carriage way)**
  - 52 km - From Gornji Đurmanec To: Jablanovec
  - 159 km - From Karlovac – Mostanje To: Gračac
- **A1, A6 (motorways – dual carriage way)**
  - 135 km - From NP Lučko (toll booth) To: NP Rijeka (toll booth)
  - 135 km – From: NP Rijeka To: NP Lučko (toll booth)
  - Video survey conducted in December 2013



FPZ - Eurorap coding tool

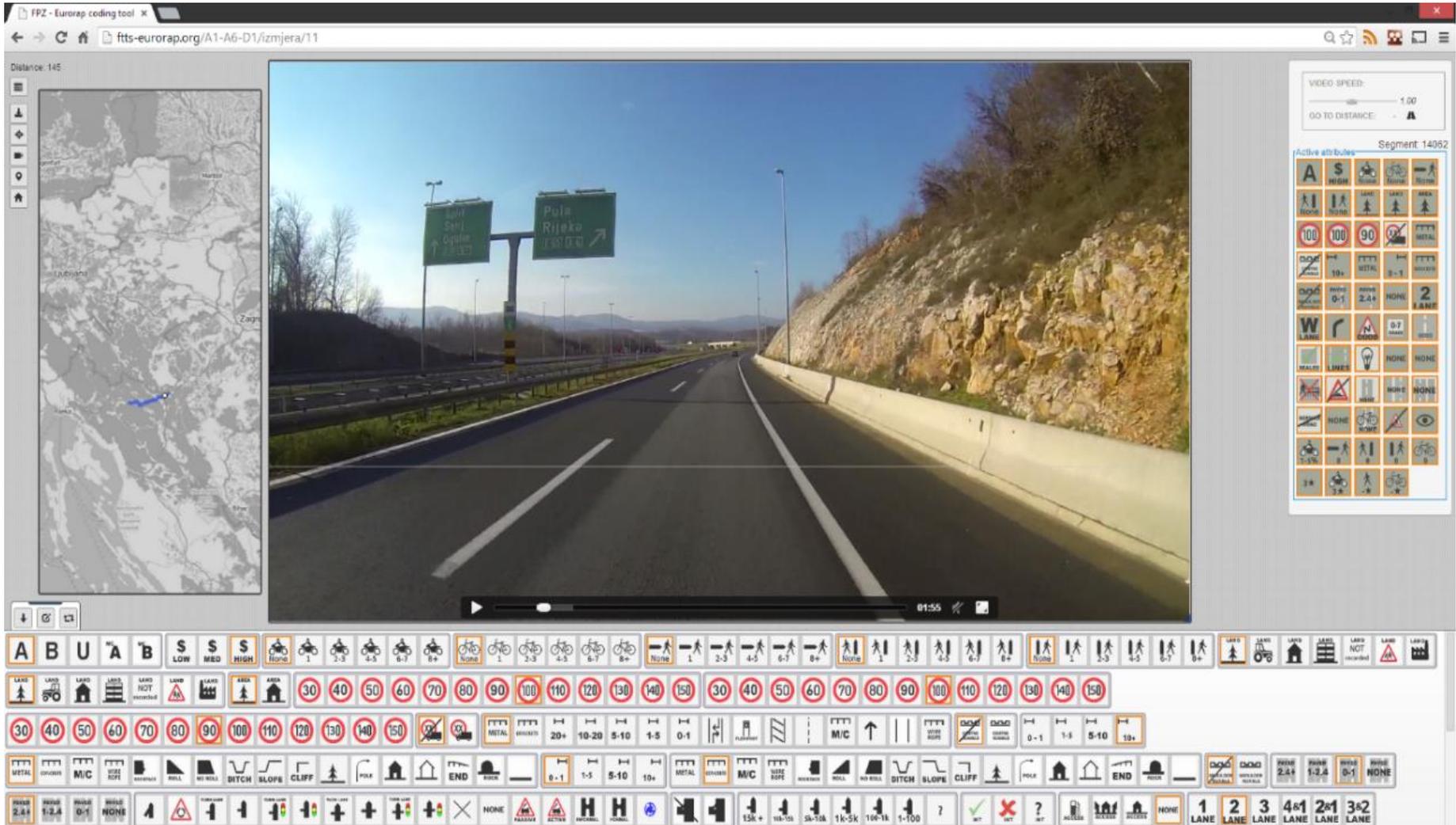
fts-eurorap.org/A1-A6-D1/izmjera/11

Distance: 145

VIDEO SPEED: 1.00  
GO TO DISTANCE: -

Segment 14062

Active attributes

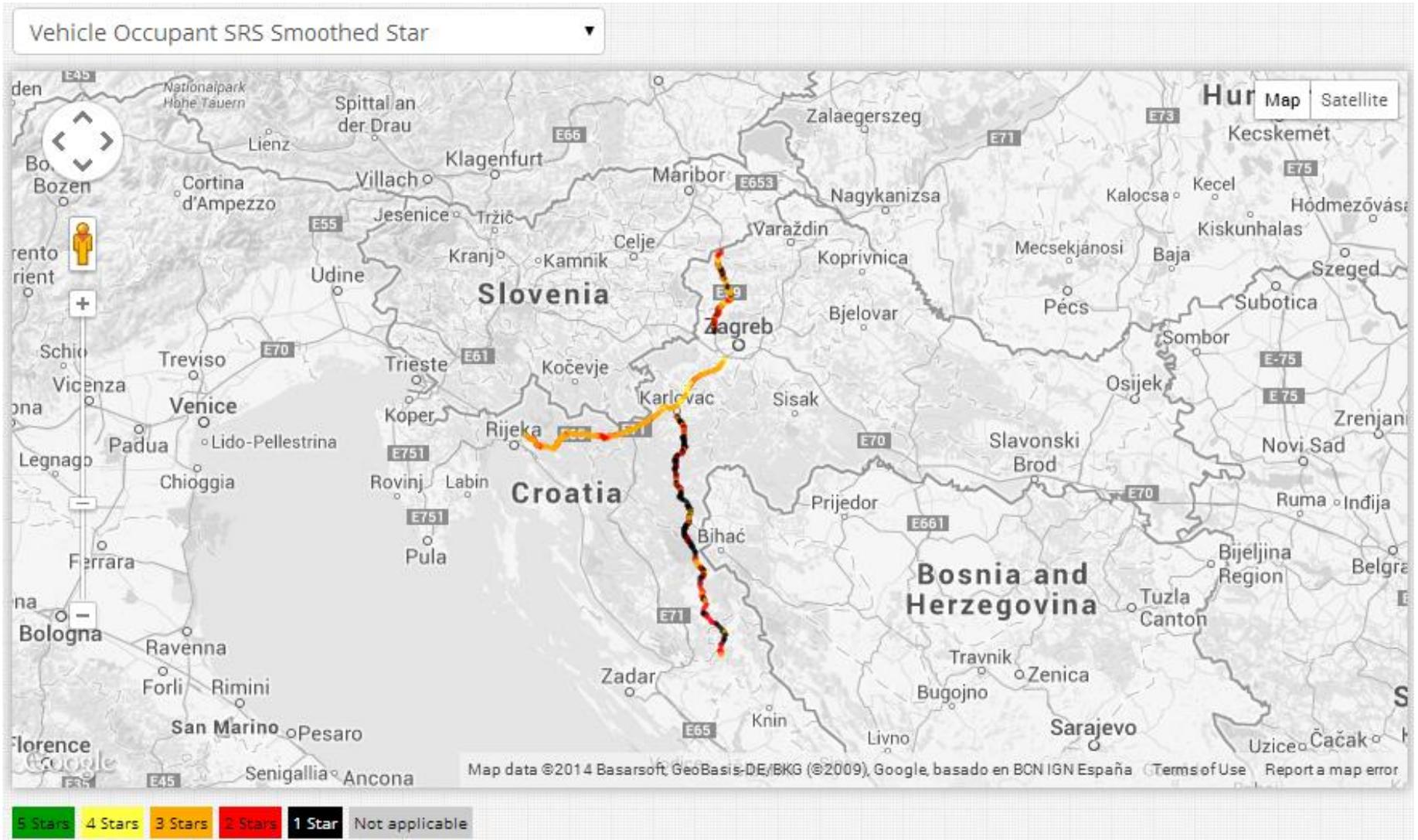


Toolbar categories and icons:

- Row 1: Lane types (A, B, U, A, B), Safety (S LOW, S MED, S HIGH), and various pedestrian and wheelchair icons.
- Row 2: Lane width and height icons, and speed limit signs (30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150).
- Row 3: Speed limit signs (30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150), and various road condition icons (METAL, M/C, etc.).
- Row 4: Road condition icons (METAL, M/C, etc.), and lane width/height icons.
- Row 5: Lane width/height icons, and lane width/height icons.

# Overall star rating results

Star Ratings	Vehicle Occupant		Motorcycle		Pedestrian		Bicycle	
	Length (kms)	Percent	Length (kms)	Percent	Length (kms)	Percent	Length (kms)	Percent
5 Stars	39.3	8%	0.4	0%	0.0	0%	0.0	0%
4 Stars	96.9	20%	8.2	2%	4.0	1%	8.1	2%
3 Stars	135.1	28%	64.1	13%	27.5	6%	51.1	11%
2 Stars	110.5	23%	229.9	48%	98.2	20%	84.0	17%
1 Star	99.2	21%	178.3	37%	81.2	17%	67.6	14%
Not applicable	0.0	0%	0.0	0%	270.0	56%	270.0	56%
Totals	480.9	100%	480.9	100%	480.9	100%	480.9	100%

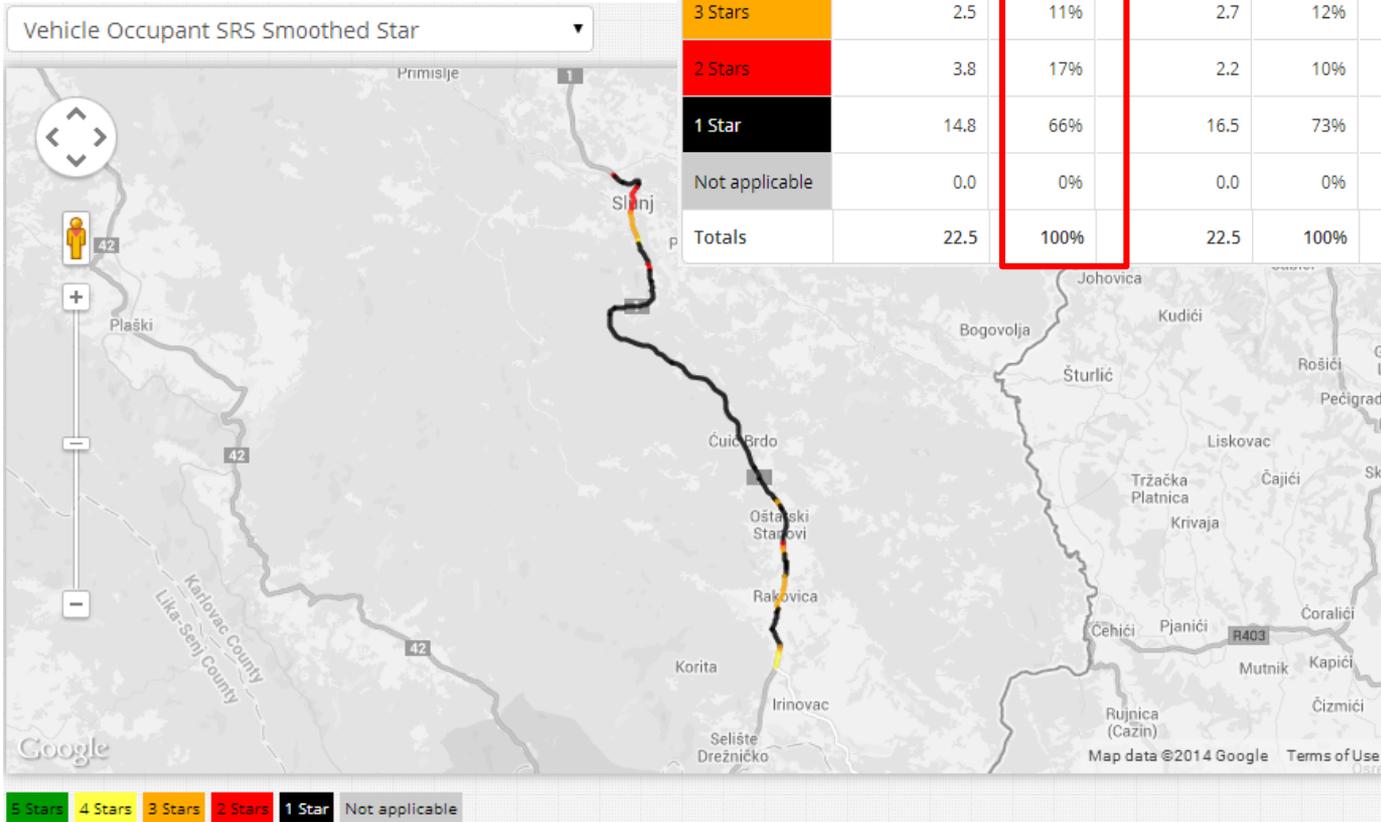


# D1 - results

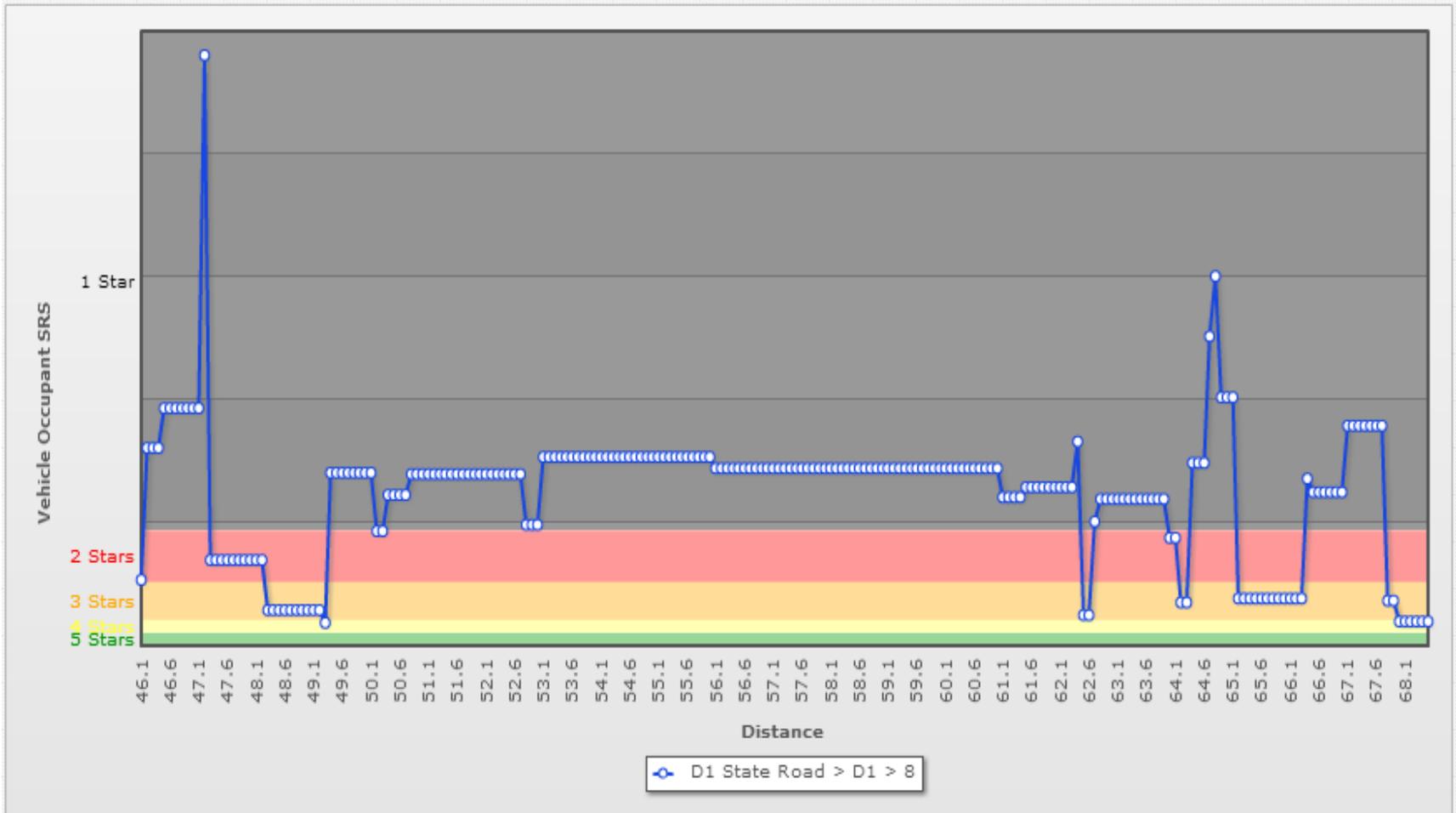
Star Ratings	Vehicle Occupant		Motorcycle		Pedestrian		Bicycle	
	Length (kms)	Percent	Length (kms)	Percent	Length (kms)	Percent	Length (kms)	Percent
5 Stars	1.5	1%	0.4	0%	0.0	0%	0.0	0%
4 Stars	12.5	6%	8.2	4%	4.0	2%	8.1	4%
3 Stars	51.2	24%	43.3	21%	27.5	13%	51.1	24%
2 Stars	58.9	28%	53.7	25%	98.1	47%	84.0	40%
1 Star	86.8	41%	105.3	50%	81.2	39%	67.6	32%
Not applicable	0.0	0%	0.0	0%	0.0	0%	0.0	0%
Totals	210.8	100%	210.8	100%	210.8	100%	210.8	100%

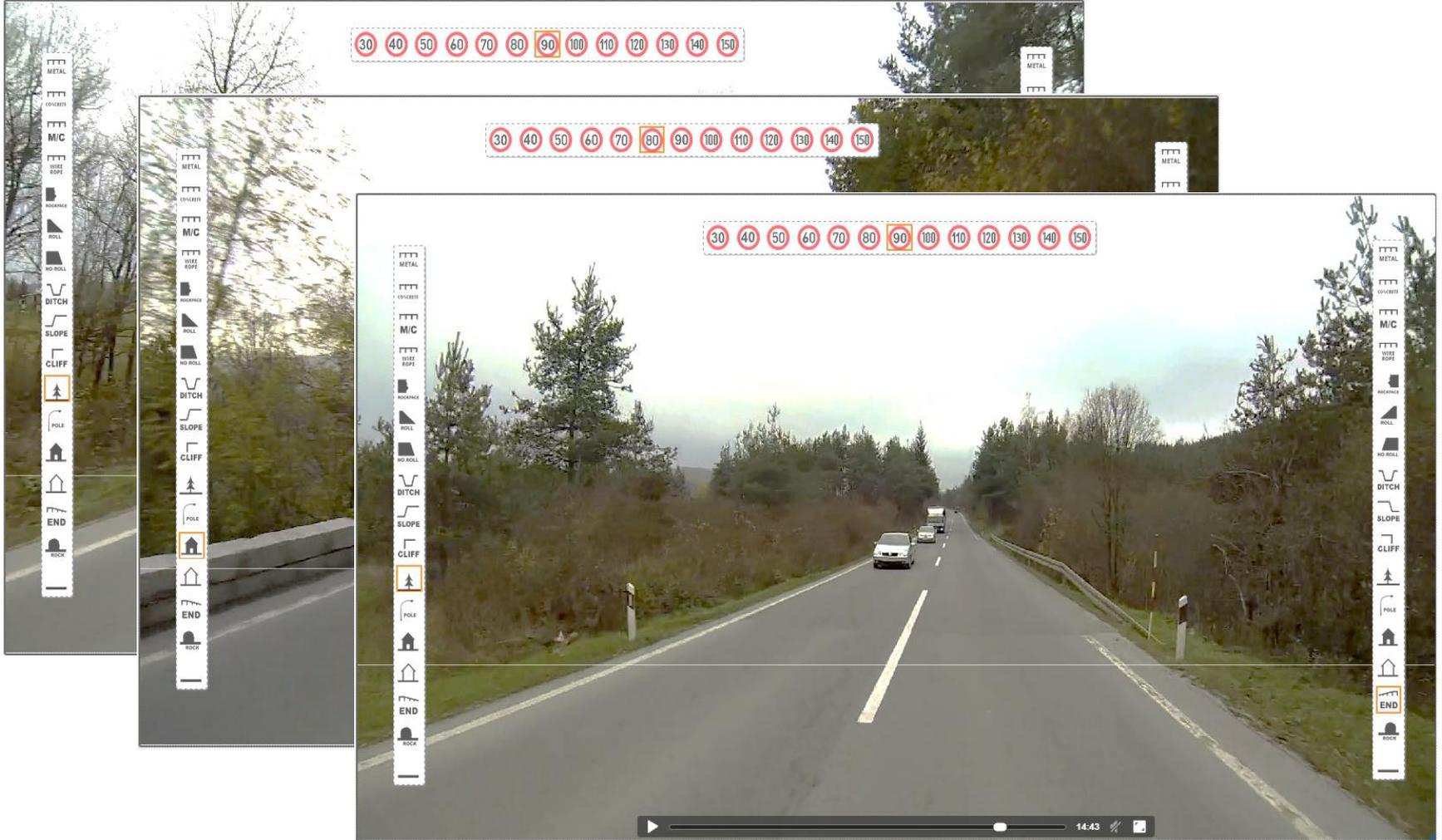
## D1 Section 8 (Slunj – Grabovac)

Star Ratings	Vehicle Occupant		Motorcycle		Pedestrian		Bicycle	
	Length (kms)	Percent	Length (kms)	Percent	Length (kms)	Percent	Length (kms)	Percent
5 Stars	0.0	0%	0.0	0%	0.0	0%	0.0	0%
4 Stars	1.4	6%	1.1	5%	1.3	6%	2.4	11%
3 Stars	2.5	11%	2.7	12%	3.5	16%	2.2	10%
2 Stars	3.8	17%	2.2	10%	10.0	44%	13.4	60%
1 Star	14.8	66%	16.5	73%	7.7	34%	4.5	20%
Not applicable	0.0	0%	0.0	0%	0.0	0%	0.0	0%
<b>Totals</b>	<b>22.5</b>	<b>100%</b>	<b>22.5</b>	<b>100%</b>	<b>22.5</b>	<b>100%</b>	<b>22.5</b>	<b>100%</b>



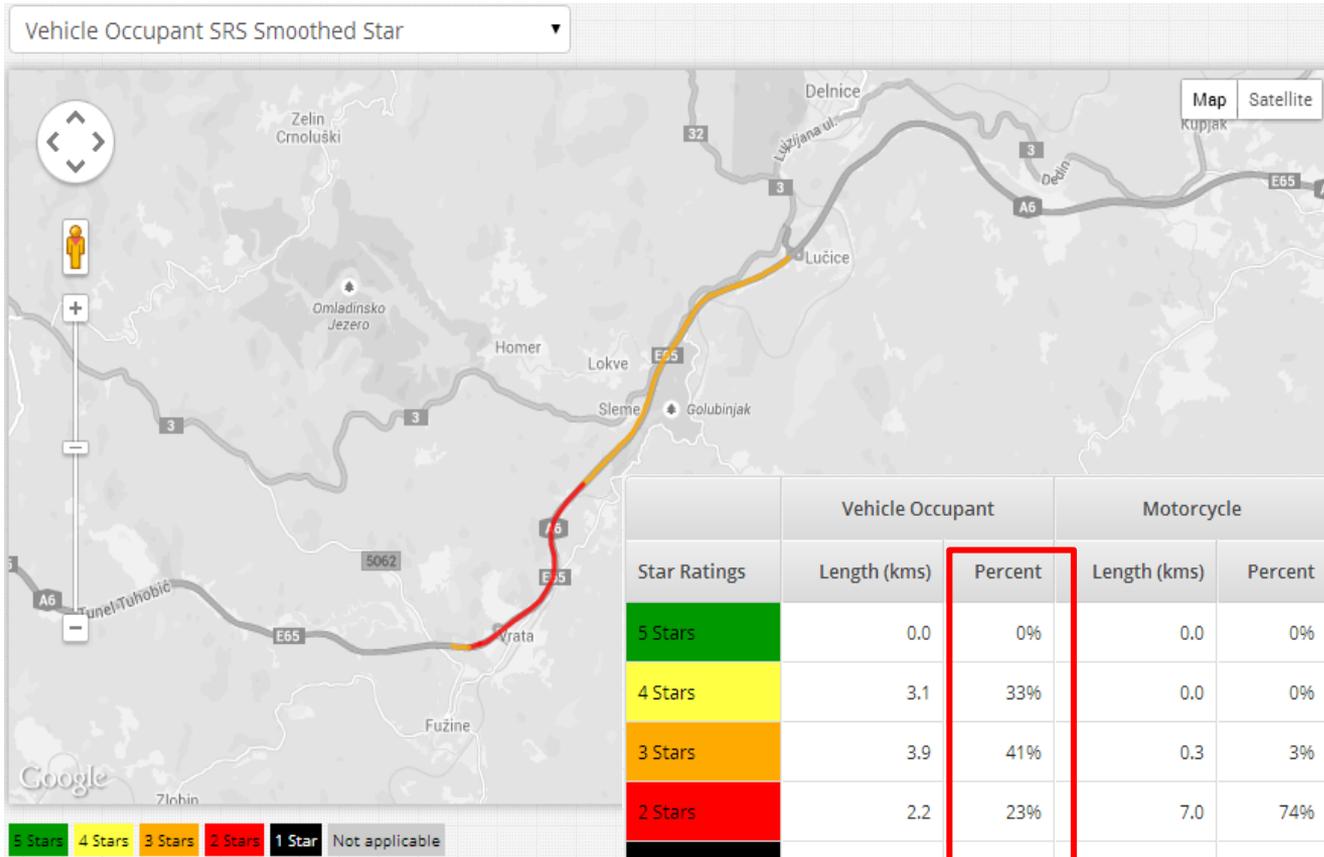
Vehicle Occupant SRS (Smoothed) ▼





# ARZ (A1, A6) results

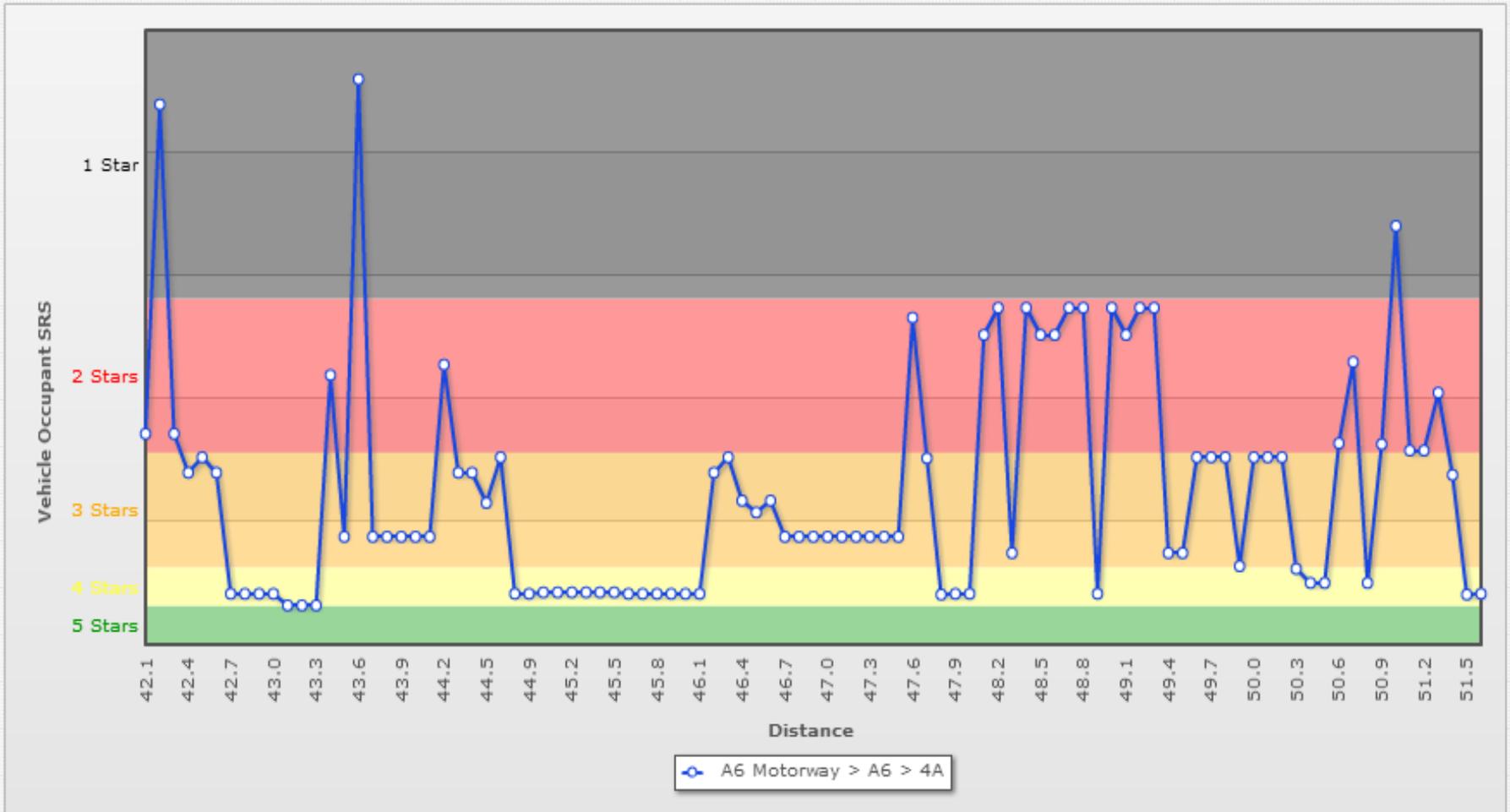
Star Ratings	Vehicle Occupant		Motorcycle		Pedestrian		Bicycle	
	Length (kms)	Percent	Length (kms)	Percent	Length (kms)	Percent	Length (kms)	Percent
5 Stars	37.8	14%	0.0	0%	0.0	0%	0.0	0%
4 Stars	84.4	31%	0.0	0%	0.0	0%	0.0	0%
3 Stars	83.9	31%	20.8	8%	0.0	0%	0.0	0%
2 Stars	51.6	19%	176.2	65%	0.0	0%	0.0	0%
1 Star	12.4	5%	73.0	27%	0.0	0%	0.0	0%
Not applicable	0.0	0%	0.0	0%	270.0	100%	270.0	100%
Totals	270.0	100%	270.0	100%	270.0	100%	270.0	100%

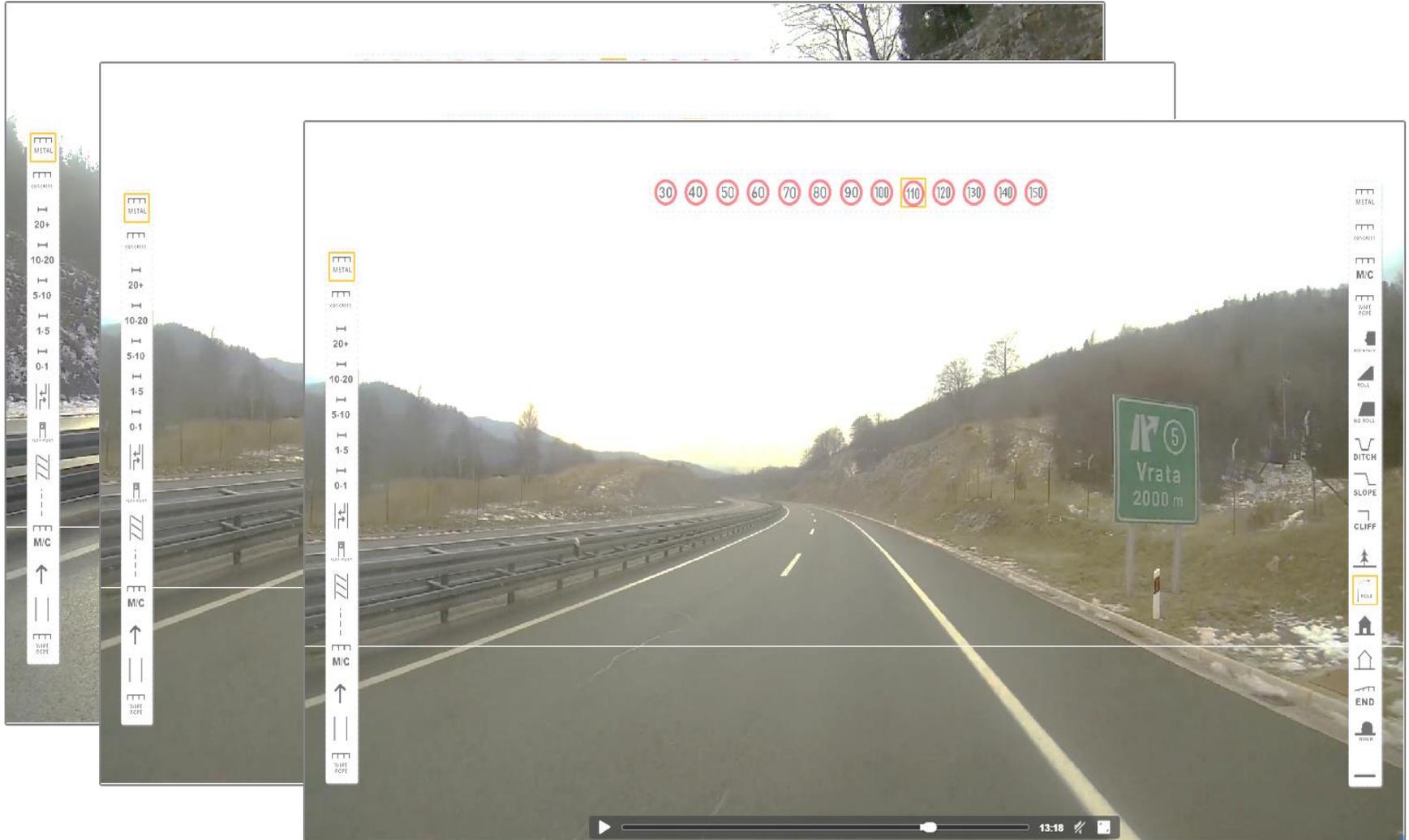


## A6 Section 4A (Delnice - Vrata)

Star Ratings	Vehicle Occupant		Motorcycle		Pedestrian		Bicycle	
	Length (kms)	Percent	Length (kms)	Percent	Length (kms)	Percent	Length (kms)	Percent
5 Stars	0.0	0%	0.0	0%	0.0	0%	0.0	0%
4 Stars	3.1	33%	0.0	0%	0.0	0%	0.0	0%
3 Stars	3.9	41%	0.3	3%	0.0	0%	0.0	0%
2 Stars	2.2	23%	7.0	74%	0.0	0%	0.0	0%
1 Star	0.3	3%	2.2	23%	0.0	0%	0.0	0%
Not applicable	0.0	0%	0.0	0%	9.5	100%	9.5	100%
<b>Totals</b>	<b>9.5</b>	<b>100%</b>	<b>9.5</b>	<b>100%</b>	<b>9.5</b>	<b>100%</b>	<b>9.5</b>	<b>100%</b>

Vehicle Occupant SRS





# Safer Roads Investments Plan (SRIP)

- 26 people died last year on this sections
- „Do nothing” scenario suggests at least 5.200 FSI on this sections in 20 years
- 70+ iRAP Countermeasures
- Minimum Benefit to Cost Ratio (BCR) set to 3

Countermeasure	Length / Sites	FSIs saved <sup>▲</sup>	PV of safety benefit	Estimated Cost	Cost per FSI saved	Program BCR
Roadside barriers - passenger side	82.3 km	440	282,190,495	51,595,270	116,798	5
Shoulder rumble strips	182.7 km	260	166,820,113	28,167,280	107,861	6
Roadside barriers - driver side	47.0 km	210	134,744,781	30,047,740	142,452	4
Delineation and signing (intersection)	109 sites	120	79,687,173	21,431,690	171,805	4
Traffic calming	17.7 km	100	69,768,823	8,341,140	76,372	8
Shoulder sealing driver side (>1m)	92.6 km	96	61,851,954	11,481,480	118,580	5
Clear roadside hazards - driver side	79.3 km	91	58,741,296	4,094,630	44,529	14
Clear roadside hazards - passenger side	94.8 km	86	54,950,737	4,779,830	55,566	11
Street lighting (mid-block)	8.0 km	86	55,176,301	16,776,520	194,230	3
Shoulder sealing passenger side (>1m)	88.5 km	79	51,096,210	11,289,040	141,135	5
Footpath provision driver side (>3m from road)	23.9 km	77	49,518,157	12,566,400	162,112	4

## After SRIP implementation: Improvement results

Total FSIs Saved	Total PV of Safety Benefits	Estimated Cost	Cost per FSI saved	Program BCR
2,050	1,312,616,495	262,450,536	127,725	5

Star Ratings	Vehicle Occupant			Motorcycle			Pedestrian			Bicycle		
	Length (kms)	Percent	Change	Length (kms)	Percent	Change	Length (kms)	Percent	Change	Length (kms)	Percent	Change
5 Stars	110.4	23%	+15%	3.4	1%	+1%	0.0	0%	±0%	1.8	0%	±0%
4 Stars	145.3	30%	+10%	32.4	7%	+5%	4.5	1%	±0%	9.2	2%	±0%
3 Stars	168.1	35%	+7%	162.0	34%	+21%	40.1	8%	+2%	64.8	13%	+2%
2 Stars	46.2	10%	-13%	244.2	51%	+3%	150.3	31%	+11%	91.5	19%	+2%
1 Star	10.9	2%	-19%	38.9	8%	-29%	16.0	3%	-14%	43.6	9%	-5%
Not applicable	0.0	0%	±0%	0.0	0%	±0%	270.0	56%	±0%	270.0	56%	±0%
Totals	480.9	100%		480.9	100%		480.9	100%		480.9	100%	

## D1 Section 8 (Slunj – Grabovac)

Total FSIs Saved	Total PV of Safety Benefits	Estimated Cost	Cost per FSI saved	Program BCR
190	126,173,946	30,323,679	153,525	4

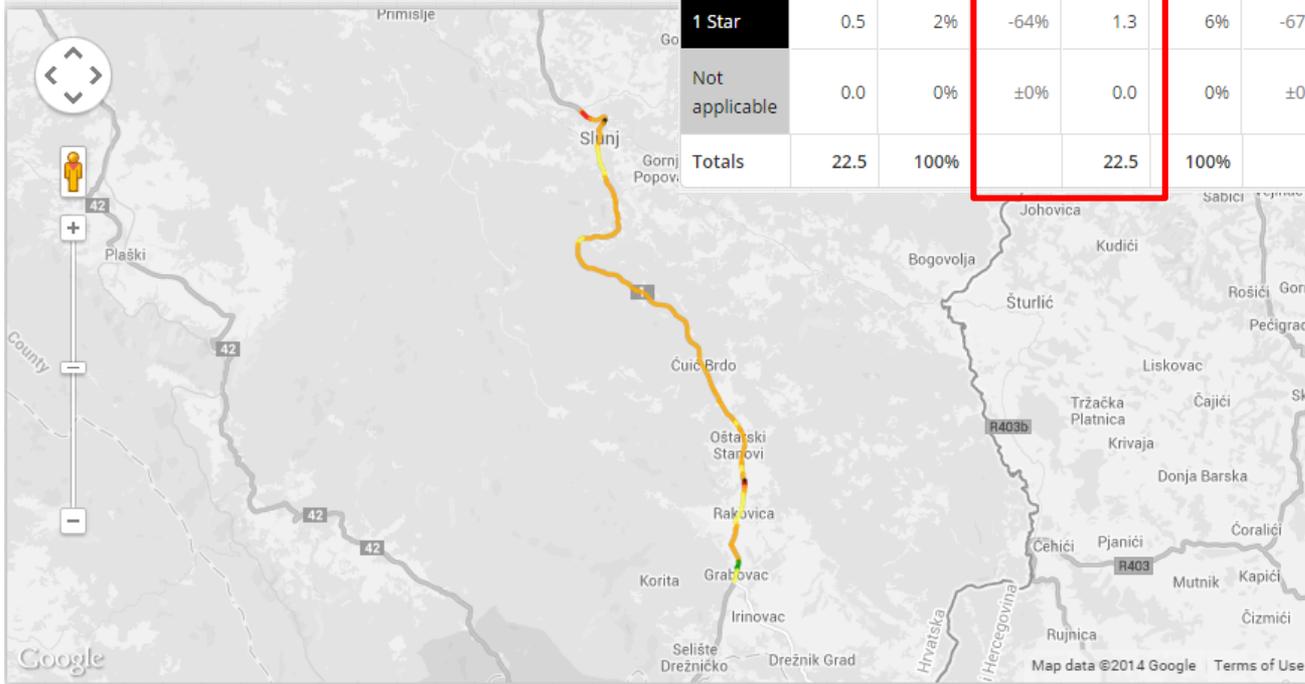
  

Countermeasure	Length / Sites	FSIs saved <sup>▲</sup>	PV of safety benefit	Estimated Cost	Cost per FSI saved	Program BCR
Delineation and signing (intersection)	33 sites	35	22,958,780	6,773,680	188,471	3
Traffic calming	3.2 km	23	15,034,205	1,489,460	63,287	10
Shoulder rumble strips	17.9 km	21	13,827,218	2,745,590	126,844	5
Roadside barriers - driver side	6.0 km	20	13,014,030	3,925,970	192,710	3
Street lighting (mid-block)	1.9 km	19	12,433,921	4,066,800	208,935	3
Clear roadside hazards - passenger side	13.5 km	14	9,557,443	686,650	45,895	14
Clear roadside hazards - driver side	11.9 km	14	9,574,300	632,960	42,232	15
Shoulder sealing driver side (>1m)	13.3 km	10	6,511,705	1,772,070	173,842	4
Shoulder sealing passenger side (>1m)	9.0 km	5	3,679,055	1,195,270	207,538	3
Footpath provision passenger side (adjacent to road)	3.0 km	5	3,308,427	1,467,000	283,254	2

# D1 Section 8 (Slunj – Grabovac)

Star Ratings	Vehicle Occupant			Motorcycle			Pedestrian			Bicycle		
	Length (kms)	Percent	Change	Length (kms)	Percent	Change	Length (kms)	Percent	Change	Length (kms)	Percent	Change
5 Stars	0.8	4%	+4%	0.3	1%	+1%	0.0	0%	±0%	0.0	0%	±0%
4 Stars	5.6	25%	+19%	3.0	13%	+8%	1.3	6%	±0%	2.7	12%	+1%
3 Stars	10.9	48%	+37%	11.9	53%	+41%	7.2	32%	+16%	5.9	26%	+16%
2 Stars	4.7	21%	+4%	6.0	27%	+17%	12.8	57%	+13%	12.4	55%	-5%
1 Star	0.5	2%	-64%	1.3	6%	-67%	1.2	5%	-29%	1.5	7%	-13%
Not applicable	0.0	0%	±0%	0.0	0%	±0%	0.0	0%	±0%	0.0	0%	±0%
<b>Totals</b>	<b>22.5</b>	<b>100%</b>		<b>22.5</b>	<b>100%</b>		<b>22.5</b>	<b>100%</b>		<b>22.5</b>	<b>100%</b>	

Vehicle Occupant SRS Smoothed Star (After) ▼



## A6 Section 4A (Delnice - Vrata)

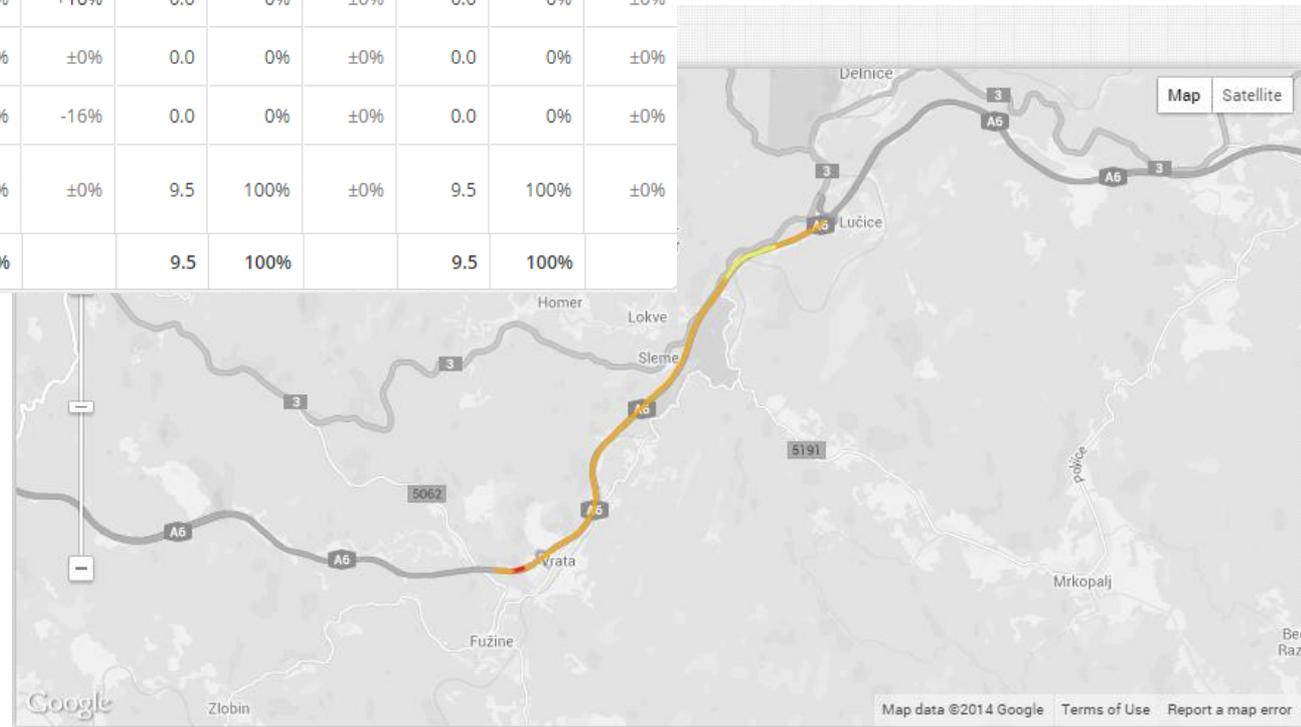
Total FSIs Saved	Total PV of Safety Benefits	Estimated Cost	Cost per FSI saved	Program BCR
9	5,961,546	1,672,196	179,183	4

Countermeasure	Length / Sites	FSIs saved ▲	PV of safety benefit	Estimated Cost	Cost per FSI saved	Program BCR
Roadside barriers - passenger side	1.9 km	6	4,245,818	1,203,500	181,072	4
Central median barrier (no duplication)	0.1 km	1	410,097	68,740	107,080	6
Roadside barriers - driver side	0.1 km	1	188,434	63,900	216,625	3
Shoulder sealing passenger side (>1m)	0.2 km	1	75,272	32,000	271,570	2
Shoulder rumble strips	1.8 km	1	1,041,924	304,050	186,415	3
		9	5,961,546	1,672,196	179,183	4

Star Ratings	Vehicle Occupant			Motorcycle			Pedestrian			Bicycle		
	Length (kms)	Percent	Change	Length (kms)	Percent	Change	Length (kms)	Percent	Change	Length (kms)	Percent	Change
5 Stars	1.4	15%	+15%	0.0	0%	±0%	0.0	0%	±0%	0.0	0%	±0%
4 Stars	3.4	36%	+3%	0.0	0%	±0%	0.0	0%	±0%	0.0	0%	±0%
3 Stars	4.0	42%	+1%	1.8	19%	+16%	0.0	0%	±0%	0.0	0%	±0%
2 Stars	0.7	7%	-16%	7.0	74%	±0%	0.0	0%	±0%	0.0	0%	±0%
1 Star	0.0	0%	-3%	0.7	7%	-16%	0.0	0%	±0%	0.0	0%	±0%
Not applicable	0.0	0%	±0%	0.0	0%	±0%	9.5	100%	±0%	9.5	100%	±0%
Totals	9.5	100%		9.5	100%		9.5	100%		9.5	100%	

## A6 Section 4A (Delnice - Vrata)





# PUBLICATION: „Results for Consultation with Stakeholders“

- <http://vida.irap.org/>
- <http://capacity.irap.org/>



# Our goal is “The Safe System”

5-star drivers in

5-star cars on

5-star roads

**Hvala na pozornosti!**

