

BRZINA I UPRAVLJANJE BRZINOM



HAK
HRVATSKI AUTOKLUB



SLAVIŠA BABIĆ
sbabic@arz.hr

Zagrebački
energetski tjedan
11.-16. 05. 2015.

HAK, 14.5.2015.

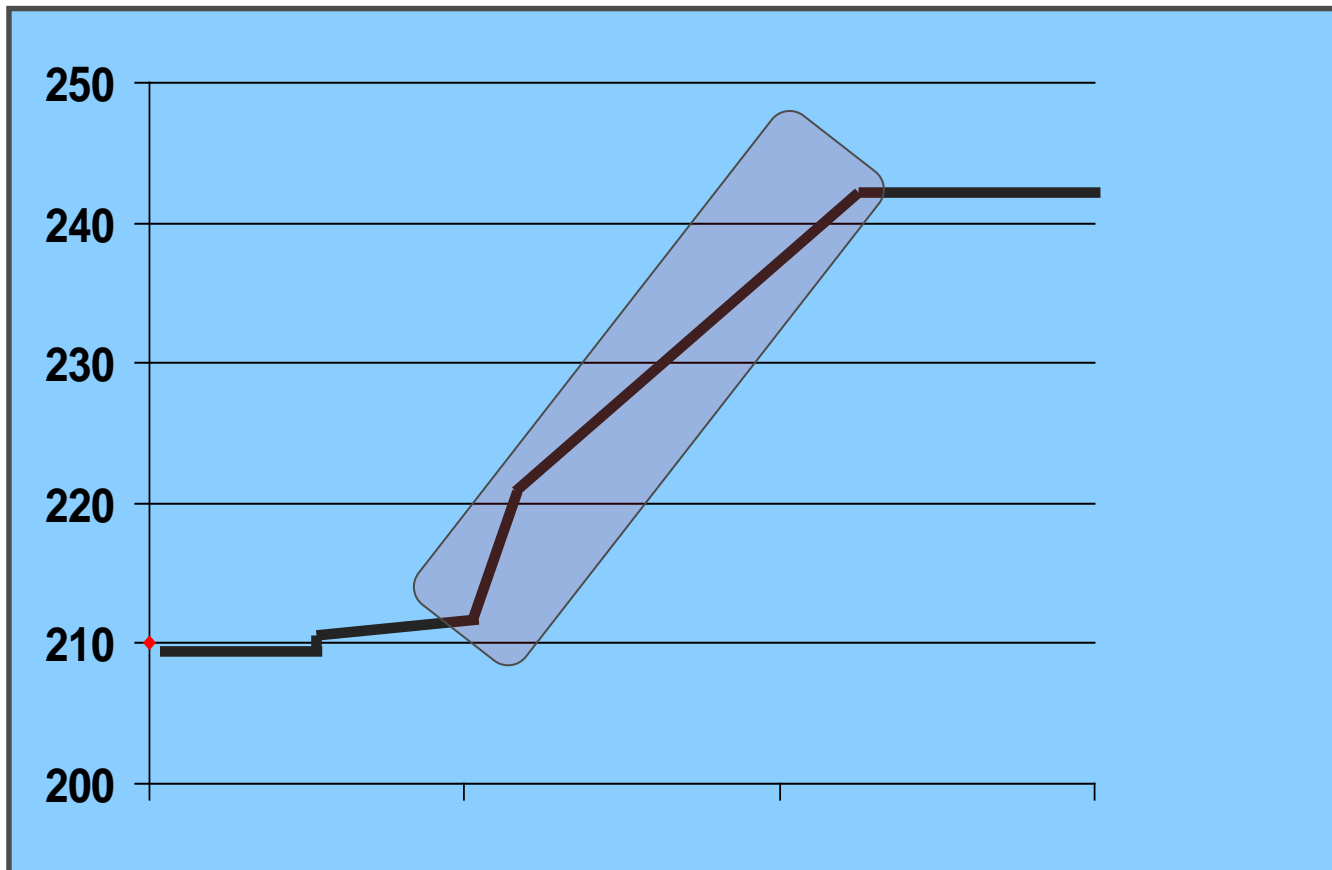
JE LI MOBILNOST SKUPA I KOLIKO ENERGIJE ZAHTIJEVA?

GRAD	Gustoća naseljenosti (st/ha)	Udio putovanja pješice, biciklom i JGP-om (%)	Udio troškova prijevoza (% BDP-a)	Godišnja potrošnja energije po stanovniku (MJ/st)	Poginuli u prometu na 1.000.000 stanovnika	Vrijeme putovanja na posao JGP-om
Houston						
Melbourne						
London						
Paris						
Munich						
Tokyo						
Hong-Kong						

Izvor: Tica, M. et al - COMBINED MOBILITY - Sinergy of mass and flexible urban passenger transport subsystem



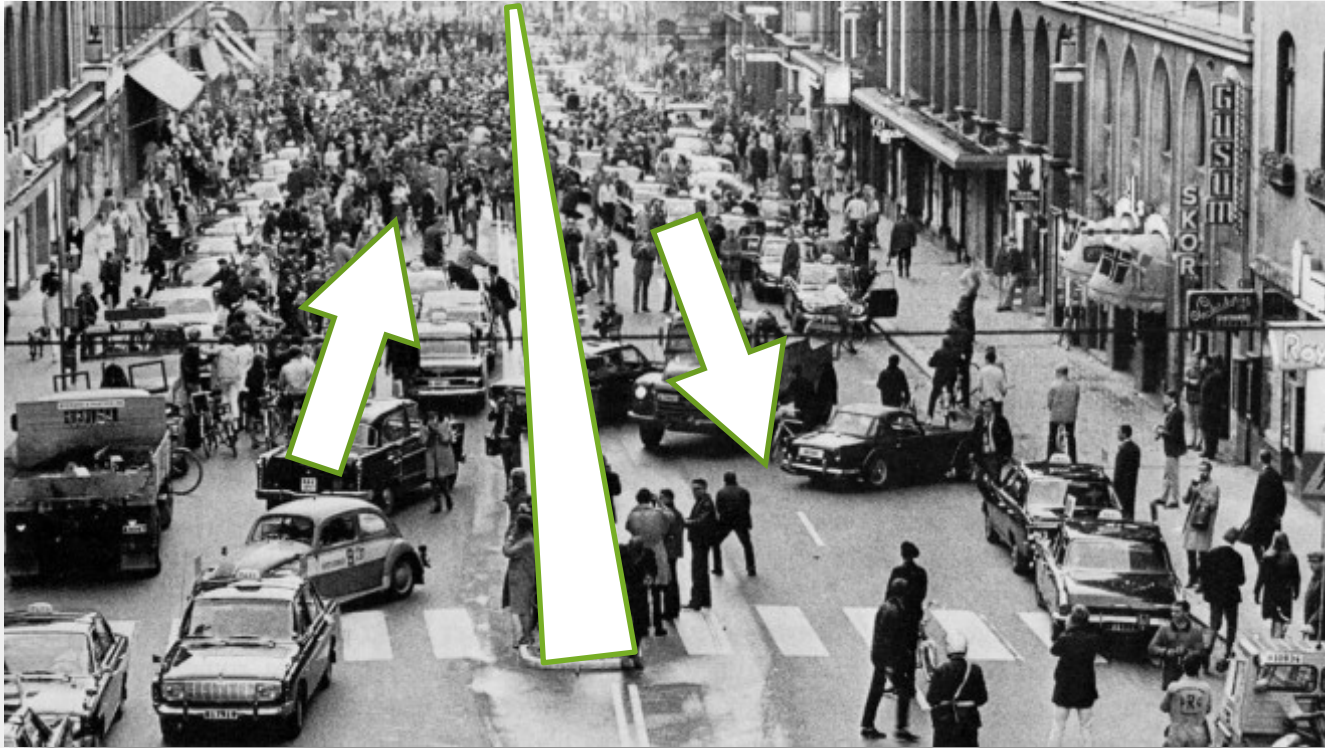
INOVACIJA I SPREMNOST NA PROMJENE



Richard Douglas "Dick" Fosbury
2,24 cm Olimpijske igre 1968.



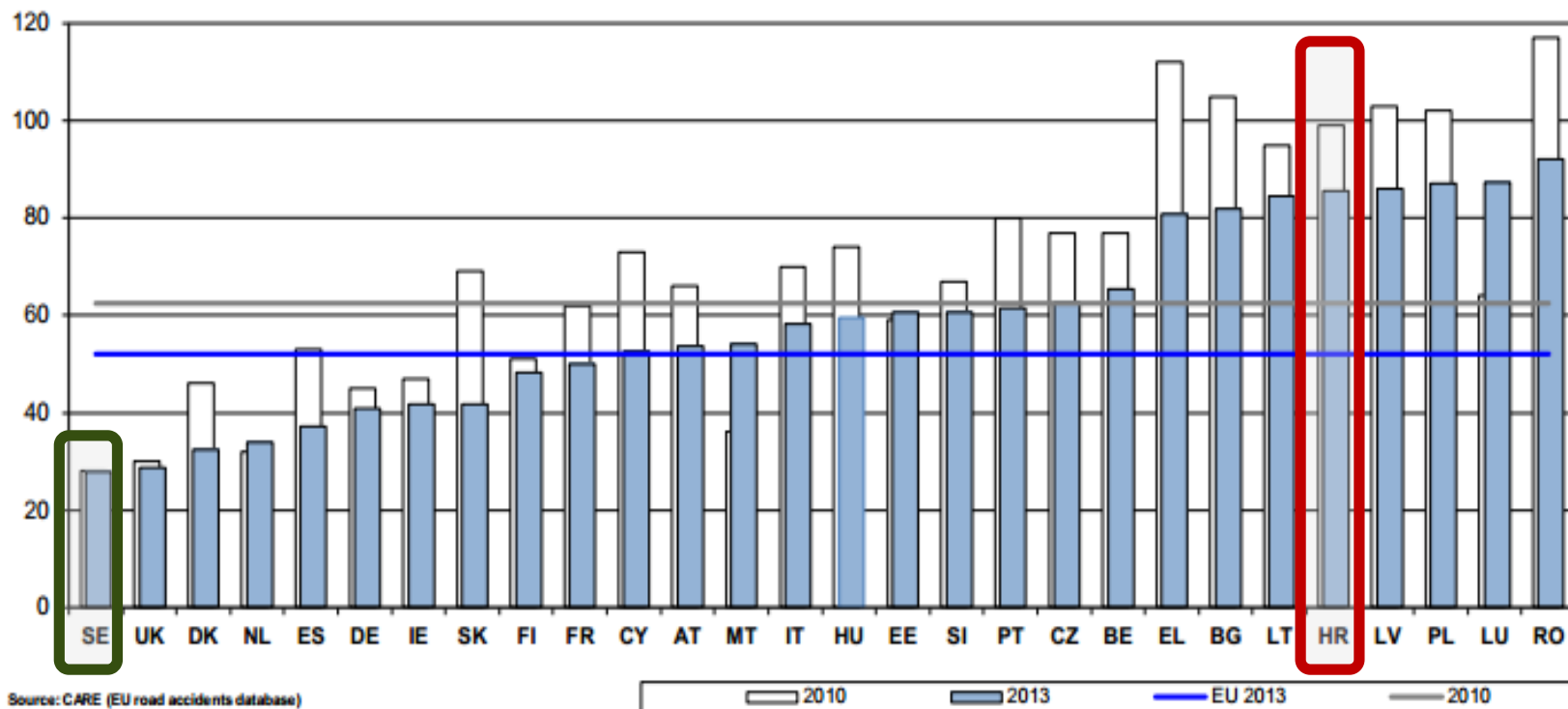
SPREMNOST NA PROMJENE



- Švedska – 3. 9. 1967. (“H” day)
- Izmjena 360.000 prometnih znakova
- 125 prometnih nesreća (bez poginulih!)
- Prije promjene - ponedjeljak 130-198 prometnih nesreća



Poginuli u cestovnom prometu na 1.000.000 stanovnika u zemljama EU



Source : CARE (EU road accidents database) or national publication:

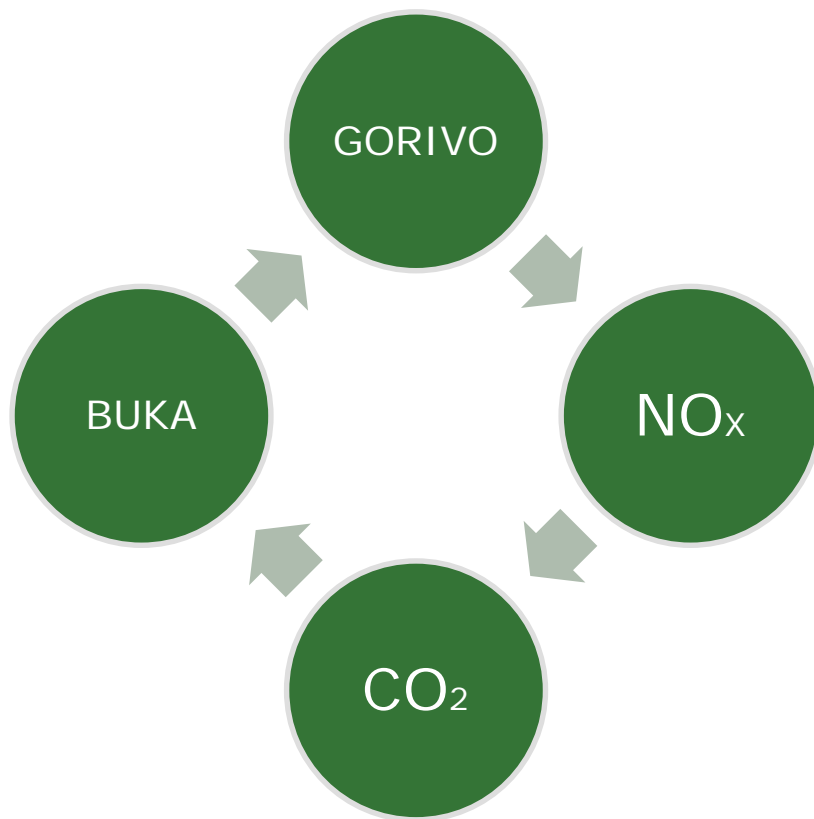
European Commission / Directorate General Energy and Transport



SPREMNOST NA PROMJENE



UTJECAJ BRZINE NA OKOLIŠ



$$\bar{a} = \frac{\Delta v}{\Delta t} = \frac{v_2 - v_1}{t_2 - t_1}$$

gdje je Δv – promjena brzine u vremenskom intervalu Δt . v_1 i v_2 su iznosi brzina u trenucima t_1 i t_2 .

Harmonizacija brzine prometnog toka!



UTJECAJ BRZINE NA OKOLIŠ (BUKA)

BUKA

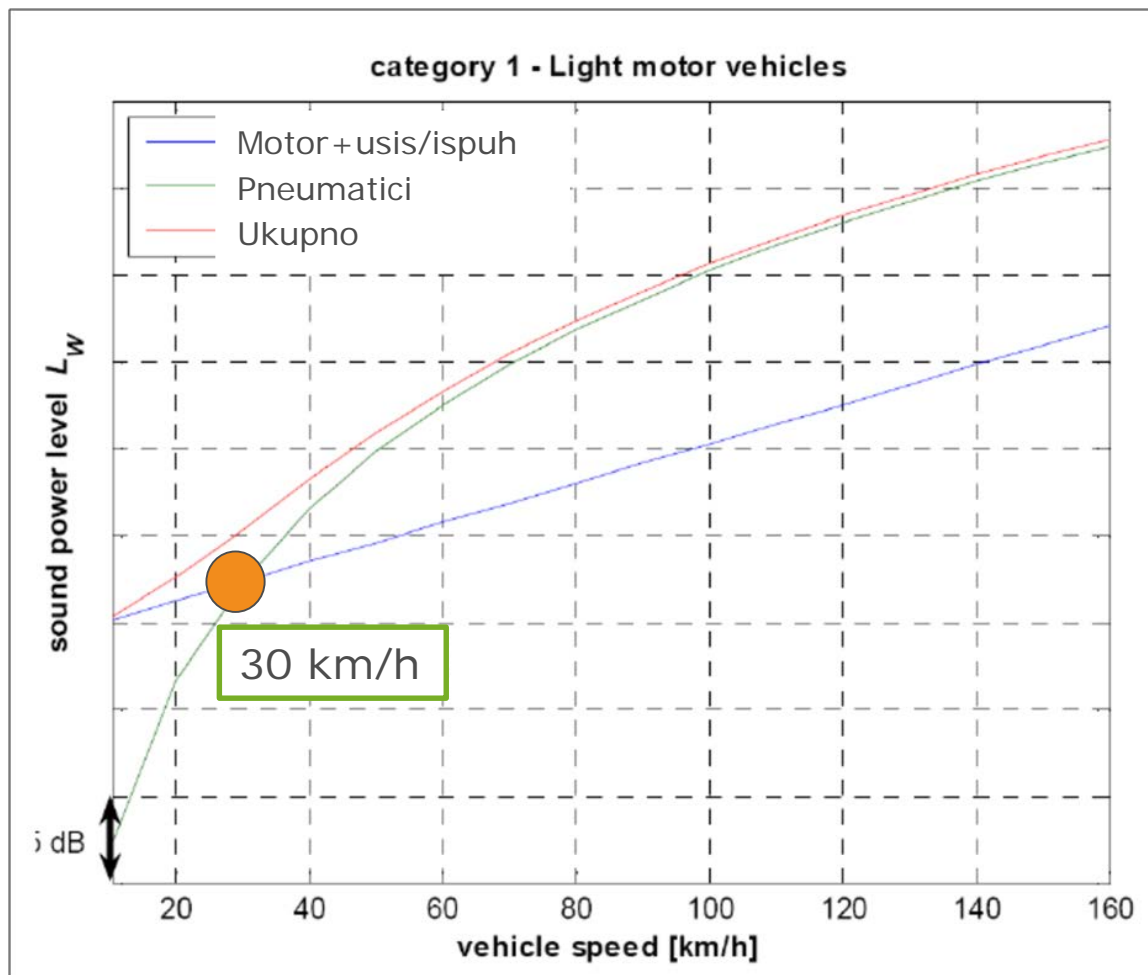
- 4.000 okr/min
- 2.000 okr/min



Izvor: <http://www.ekovoznja.hr>



UTJECAJ BRZINE NA OKOLIŠ (BUKA)



Hibridna i električna vozila

vs

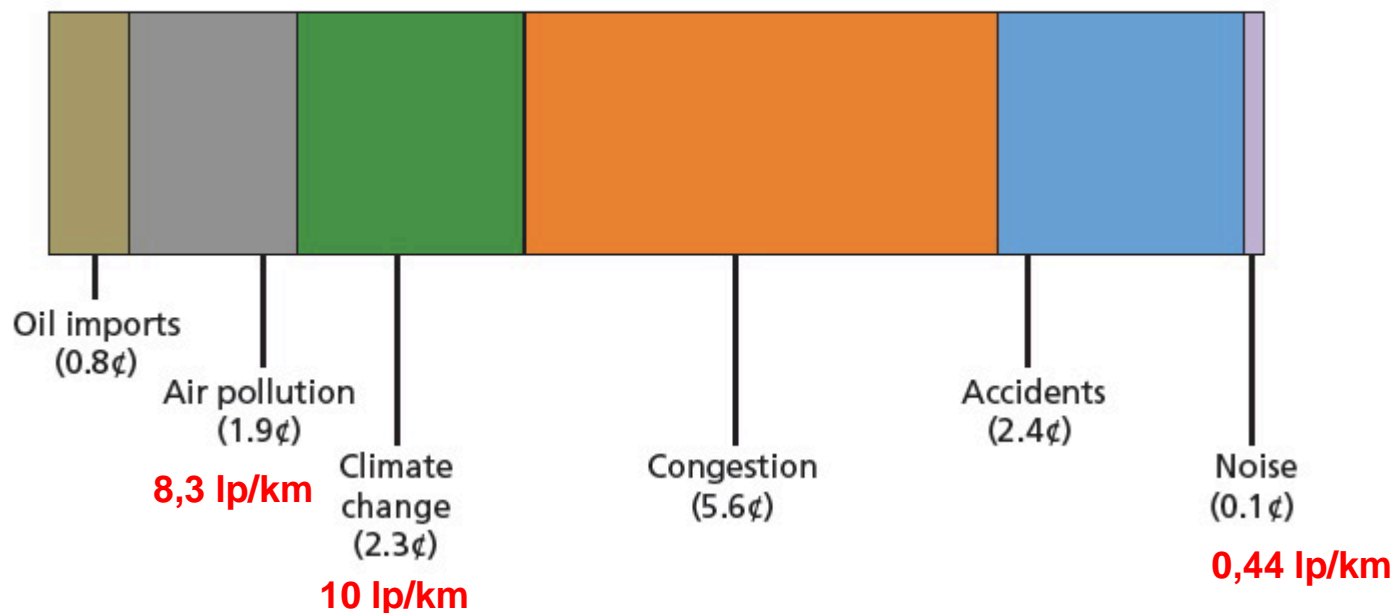
“klasična” vozila

Izvor: Bolkovac, I., Utjecaj hibridnih i električnih vozila na buku prometa, pozitivni i negativni aspekti i moguća rješenja



TROŠKOVI (UTJECAJA NA OKOLIŠ)

An Estimate of the Per-Mile Externalities Associated with Driving an Automobile



Izvor: <http://www.infrastructureusa.org>



BRZINA - MITOVI

$s = 200 \text{ km}$
 $v = 140 \text{ km/h}$
 $t = 86 \text{ min}$

$s = 200 \text{ km}$
 $v = 130 \text{ km/h}$
 $t = 93 \text{ min}$

7 min!

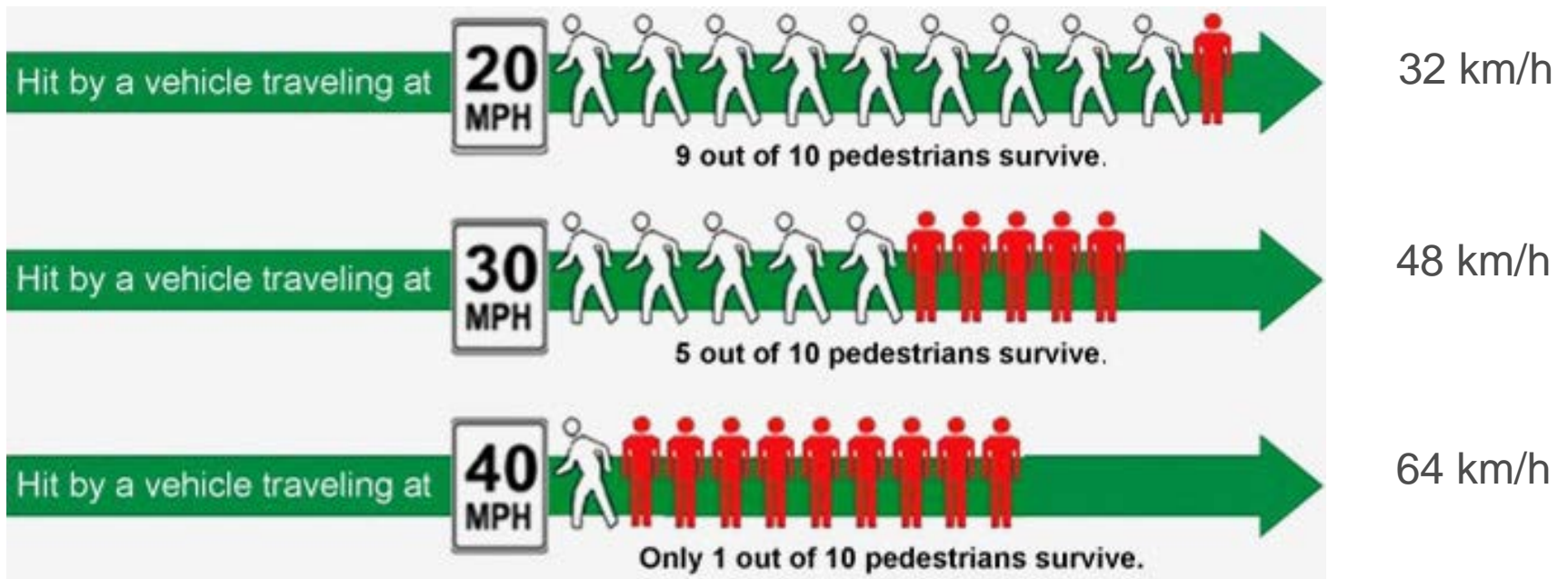


BRZINA - MITOVI

$s = 7 \text{ km}$
 $v = 65 \text{ km/h}$
 $t = 6,5 \text{ min}$

2 min!

$s = 7 \text{ km}$
 $v = 50 \text{ km/h}$
 $t = 8,5 \text{ min}$



BRZINA KAO ČIMBENIK SIGURNOSTI U PROMETU

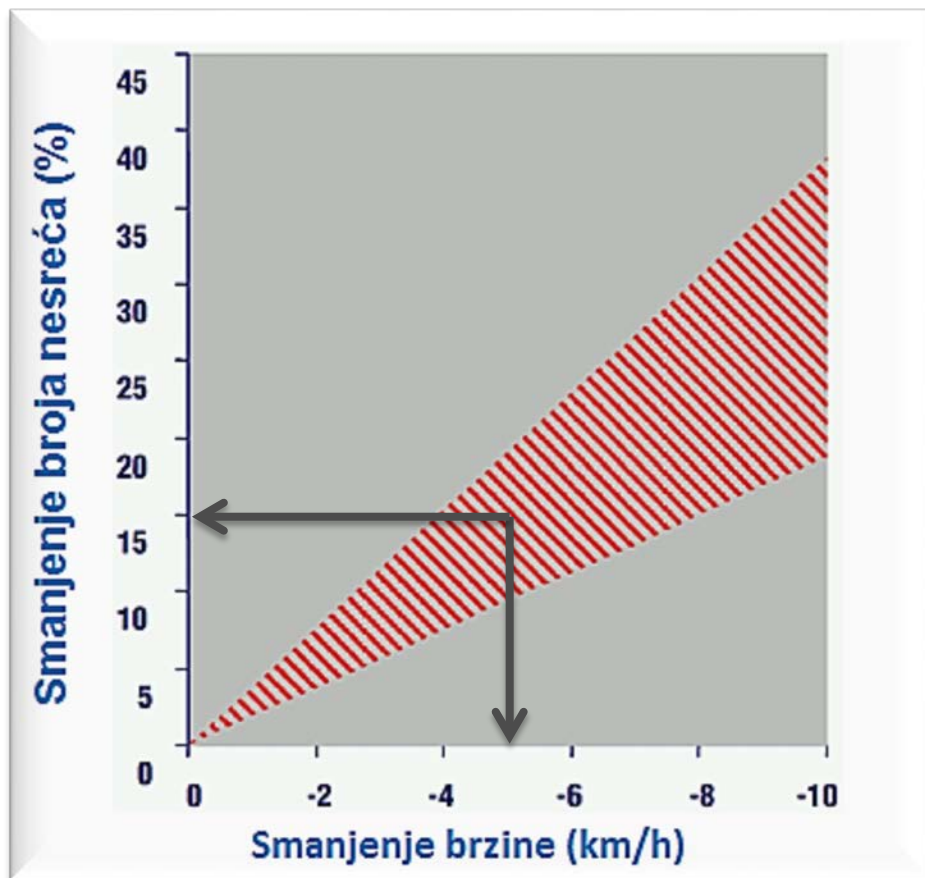
Pogreške vozača	Nesreće s nastradalim osobama			Poginuli		Ozlijeđeni	
	2013.	2014.	+ - %	2013.	2014.	2013.	2014.
Nepropisna brzina	311	329	+5,8	15	15	407	438
Brzina neprimjerena uvjetima	3.533	3.195	-9,6	151	126	5.008	4.418
Vožnja na nedovoljnoj udaljenosti	822	864	+5,1	12	11	1.188	1.229
Zakašnjelo uočavanje opasnosti	101	79	-21,8	3	6	127	101
Nepropisno pretjecanje	313	271	-13,4	16	10	447	411
Nepropisno obilaženje	90	108	+20,0	3	1	102	116
Nepropisno mimoilaženje	87	83	-4,6	4	2	139	125
Nepropisno uključenje u promet	529	544	+2,8	3	5	669	652
Nepropisno skretanje	458	430	-6,1	6	3	581	570
Nepropisno okretanje	45	46	+2,2	1	1	57	61
Nepropisna vožnja unazad	232	192	-17,2	2	1	240	220
Nepropisno prestrojavanje	121	110	-9,1	1	1	167	159
Nepoštivanje prednosti prolaza	1.816	1.618	-10,9	29	26	2.688	2.351
Nepropisno parkiranje	7	7	0,0	1		10	7
Naglo usporavanje - kočenje	30	20	-33,3		1	31	26
Nepoštivanje svjetlosnog znaka	225	213	-5,3	9	2	324	325
Neosiguran teret na vozilu	3	8	+166,7			3	8
Nemarno postupanje s vozilom	60	77	+28,3	2	2	71	89
Ostale pogreške vozača	1.280	1.259	-1,6	56	46	1.535	1.465
Nepropisno kretanje voz.na kolniku	663	682	+2,9	35	33	908	943
UKUPNO	10.726	10.135	-5,5	349	292	14.702	13.714

→ 141/308

Prikaz podjele pogrešaka vozača kao okolnosti koja je prethodila prometnim nesrećama za 2013. i 2014. godinu (izvor: MUP, Statistički pregled temeljnih sigurnosnih pokazatelja i rezultata rada u 2014. godini.)



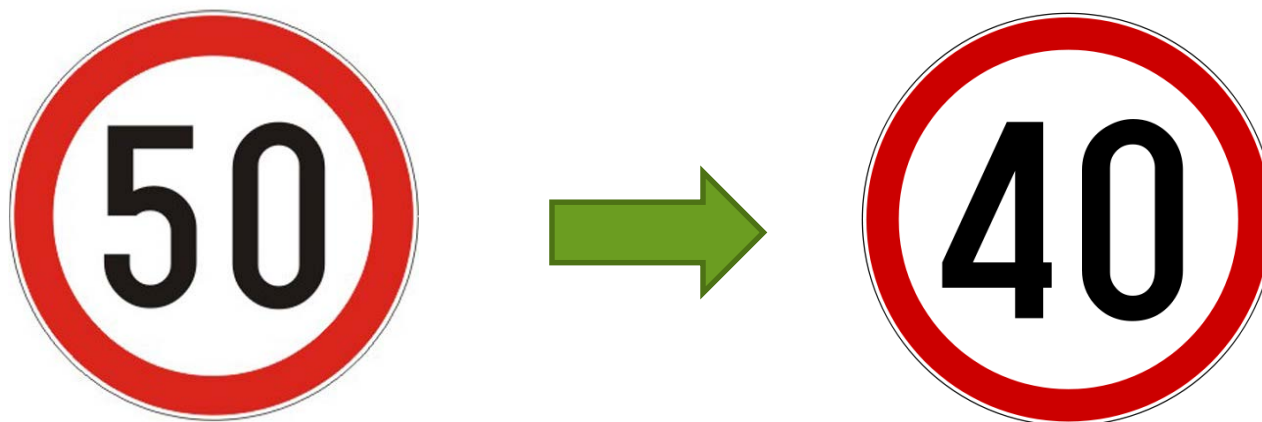
BRZINA KAO ČIMBENIK SIGURNOSTI U PROMETU



(izvor: mr.sc. Nebojša Doder, Teoretska povezanost brzine i sigurnosti cestovnog prometa)



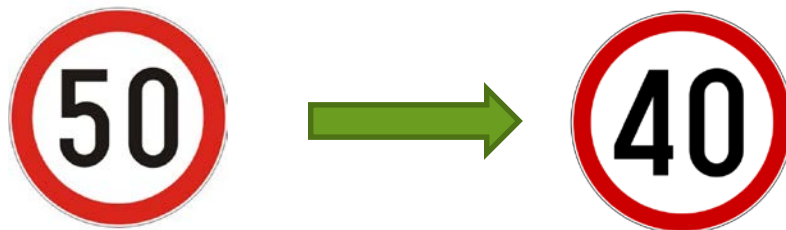
BRZINA KAO ČIMBENIK SIGURNOSTI U PROMETU



- Stvarni učinak – smanjenje V_{pr} za $\frac{1}{4}$ razlike smanjenja V_{og}
- Devijacija brzine prometnog toka?
- Motivacija vozača da se pridržavaju V_{og} ?



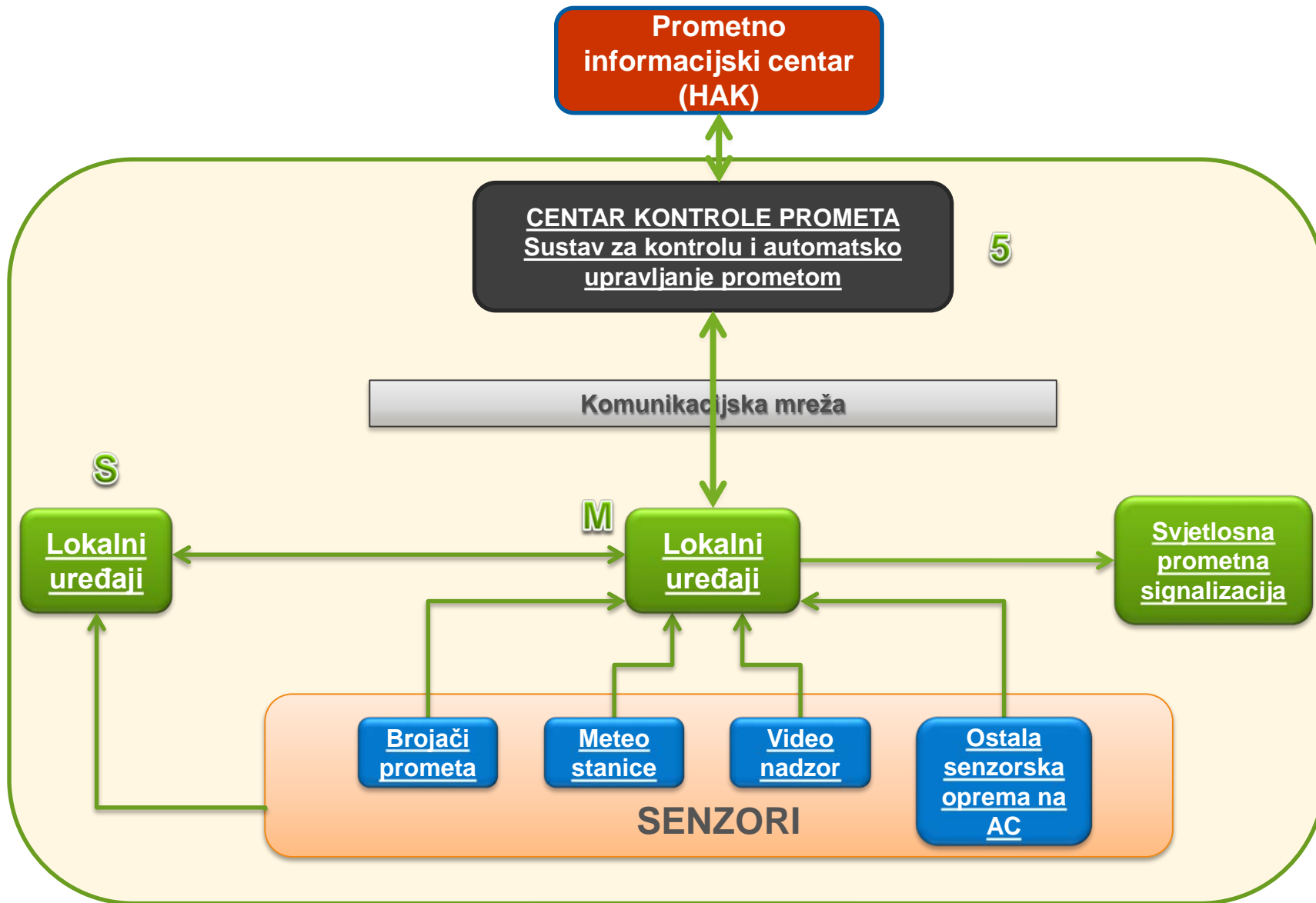
BRZINA KAO ČIMBENIK SIGURNOSTI U PROMETU



- Edukacija i kampanje (opasnosti, potrošnja goriva, zagađenje okoliša...)
 - Centar sigurne vožnje
 - Škola eko vožnje
- Kvalitetno upravljanje brzinom
 - Pravilno postavljanje ograničenja brzine
 - Upravljanje prometnim tokom
 - Mjere smirivanja prometa
 - Represija (povremeni i stalni nadzor brzine)



PROMETNO INFORMACIJSKI SUSTAV



PROMETNO INFORMACIJSKI SUSTAV

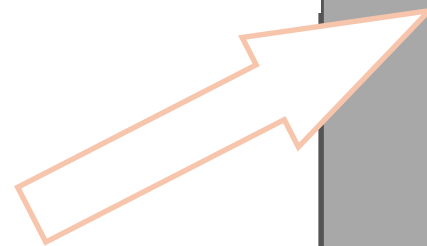
Lokalni uređaj
(Cestovna prometna stanica)



=



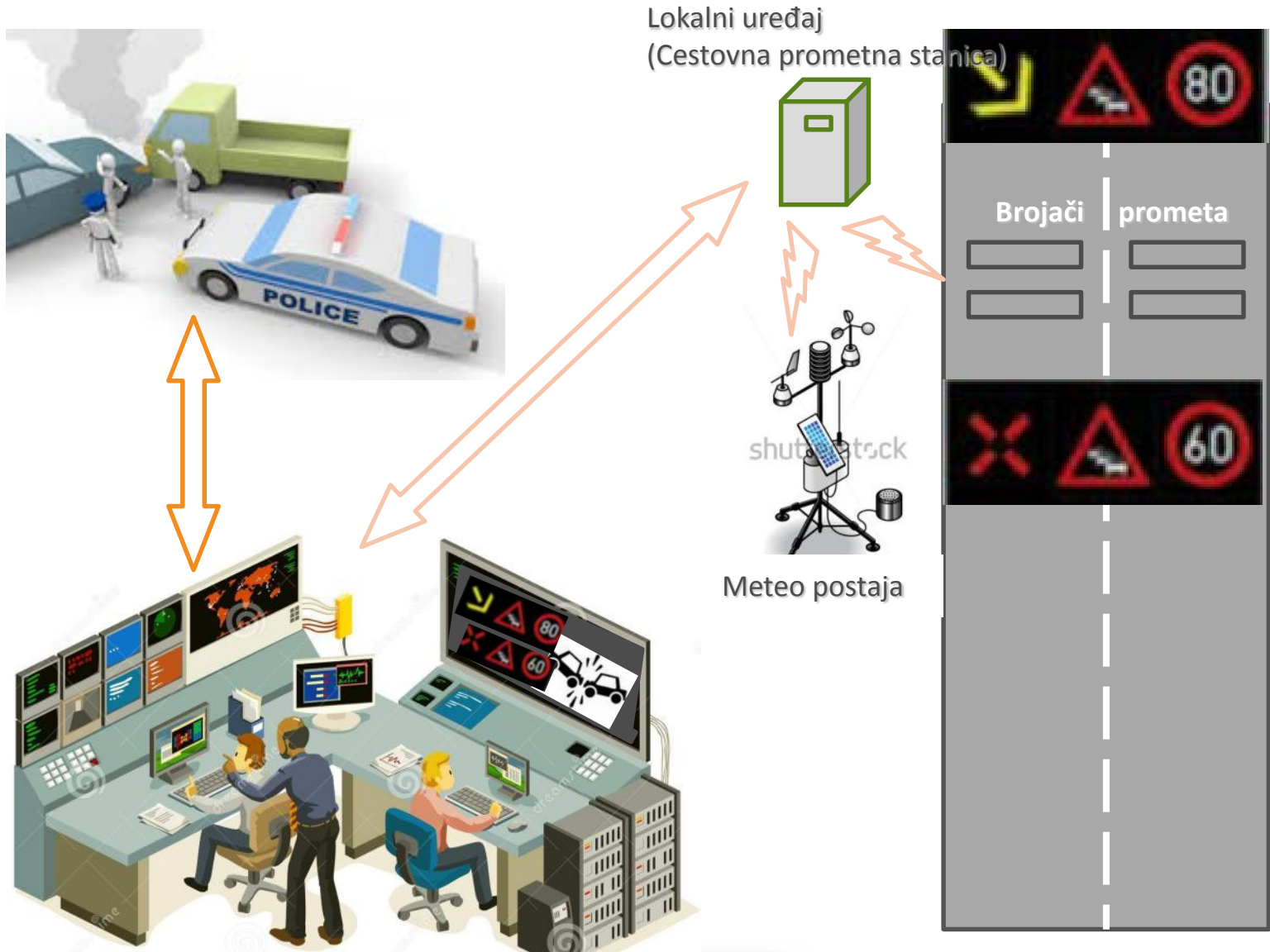
Meteo postaja



CENTAR KONTROLE PROMETA



PROMETNO INFORMACIJSKI SUSTAV



CENTAR KONTROLE
PROMETA



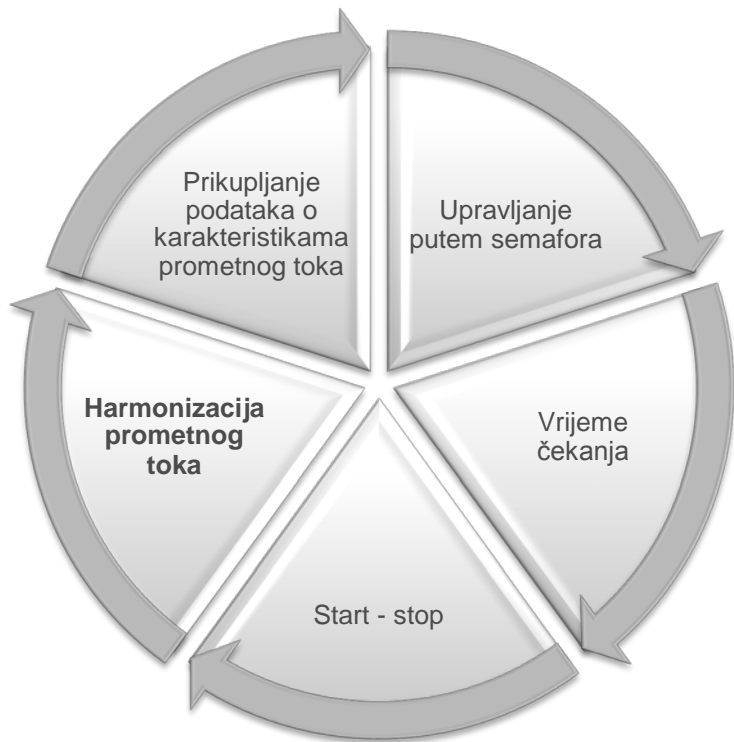


Izvor: Peek promet d.o.o.



Harmonizacija prometnog toka

Prometni sustav - Grad



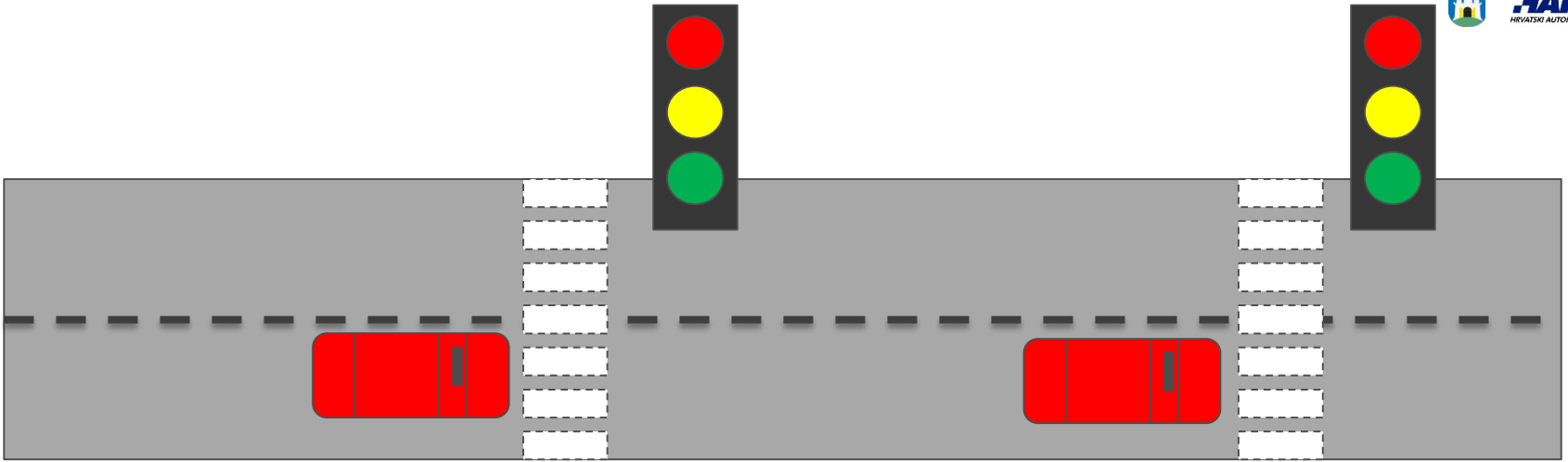
Prometni sustav - Autocesta



Prikupljanje podataka o meteo uvjetima
Upravljanje putem SPZ-a

Komunikacijski protokol

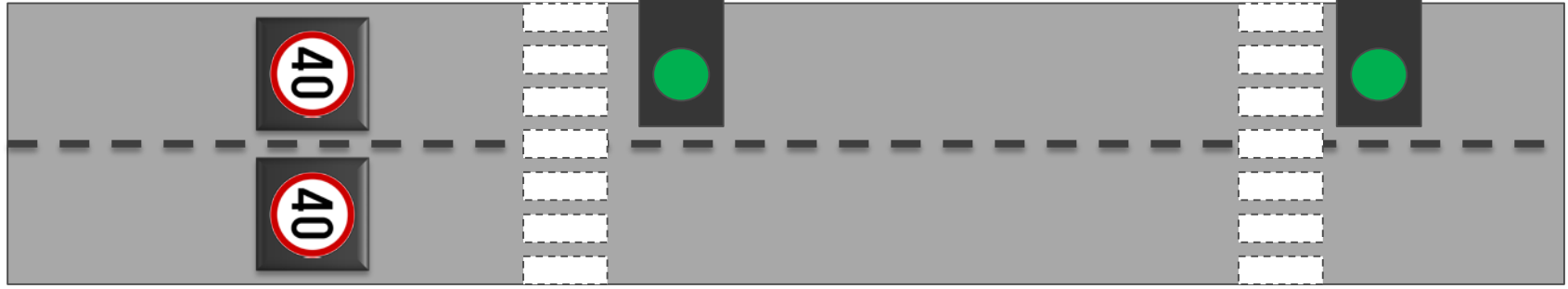


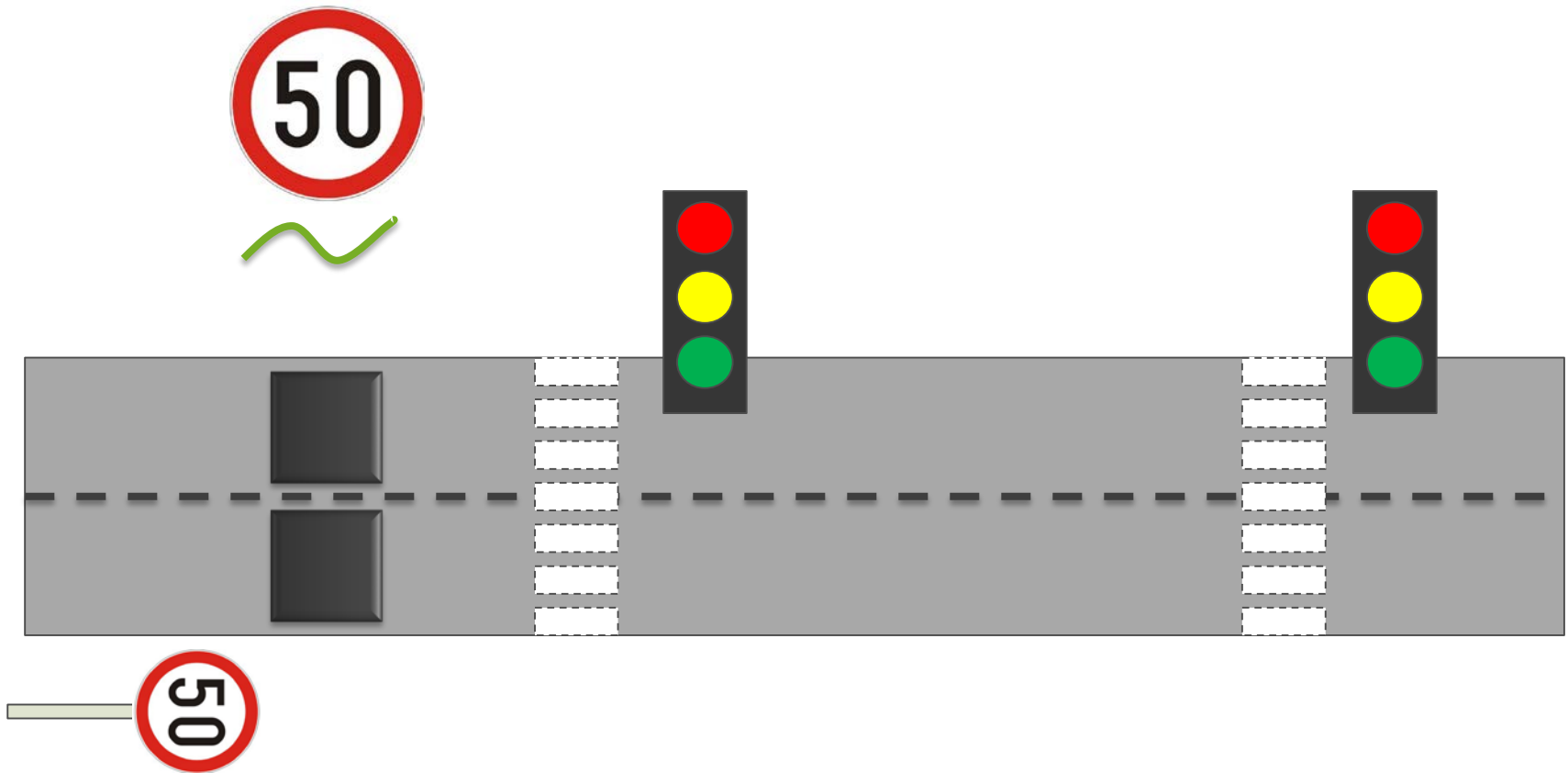


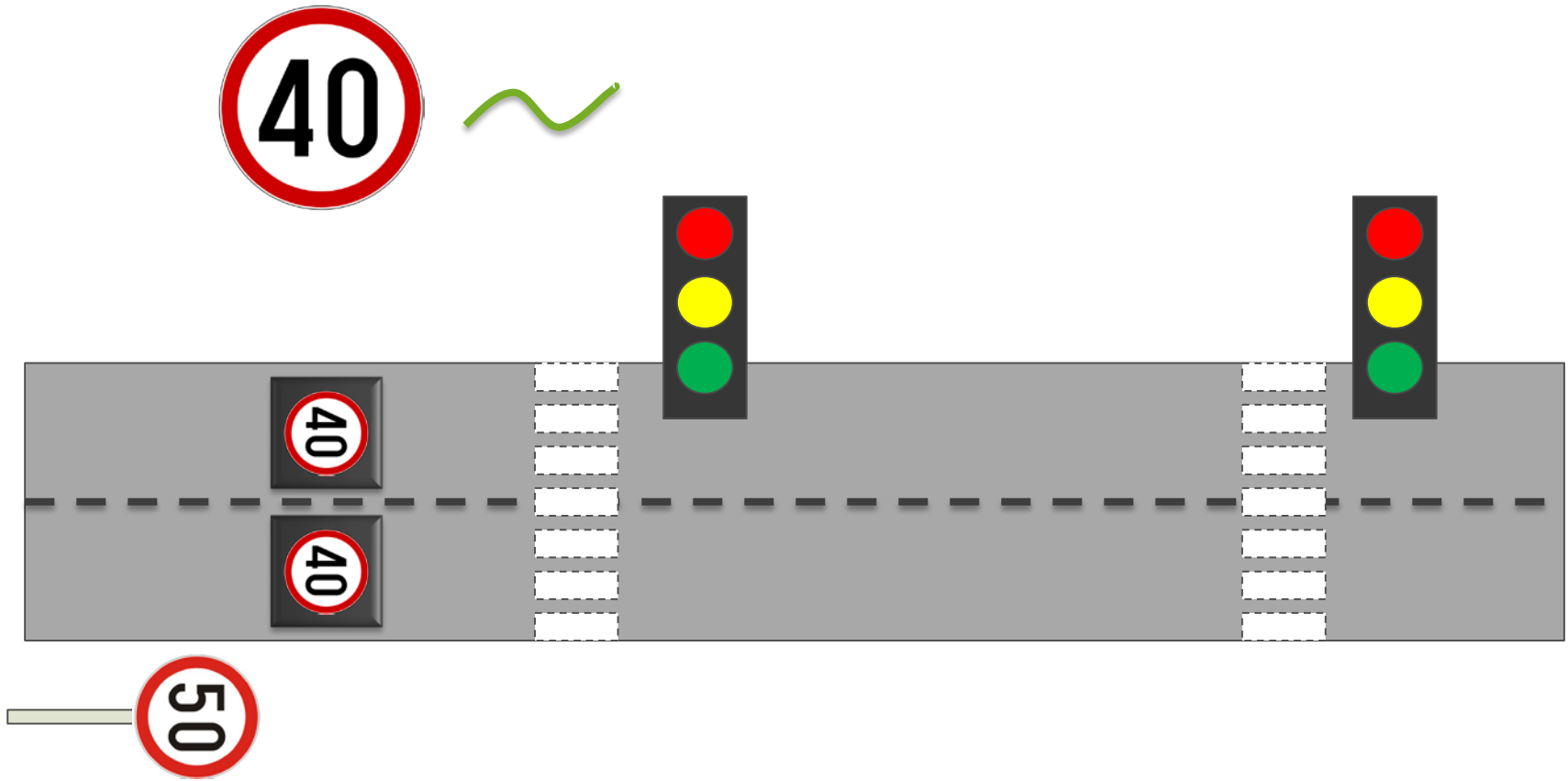
60 km/h



50 km/h







UPRAVLJANJE PROMETOM PUTEM SPZ-a



UPRAVLJANJE PROMETOM PUTEM SPZ-a



UPRAVLJANJE PROMETOM PUTEM SPZ-a



MJERENJE BRZINE (ARZ) - LOKACIJE

**AUTOCESTE U
REPUBLICI HRVATSKOJ
MREŽA I KONCESIONARI**



“CORDON”

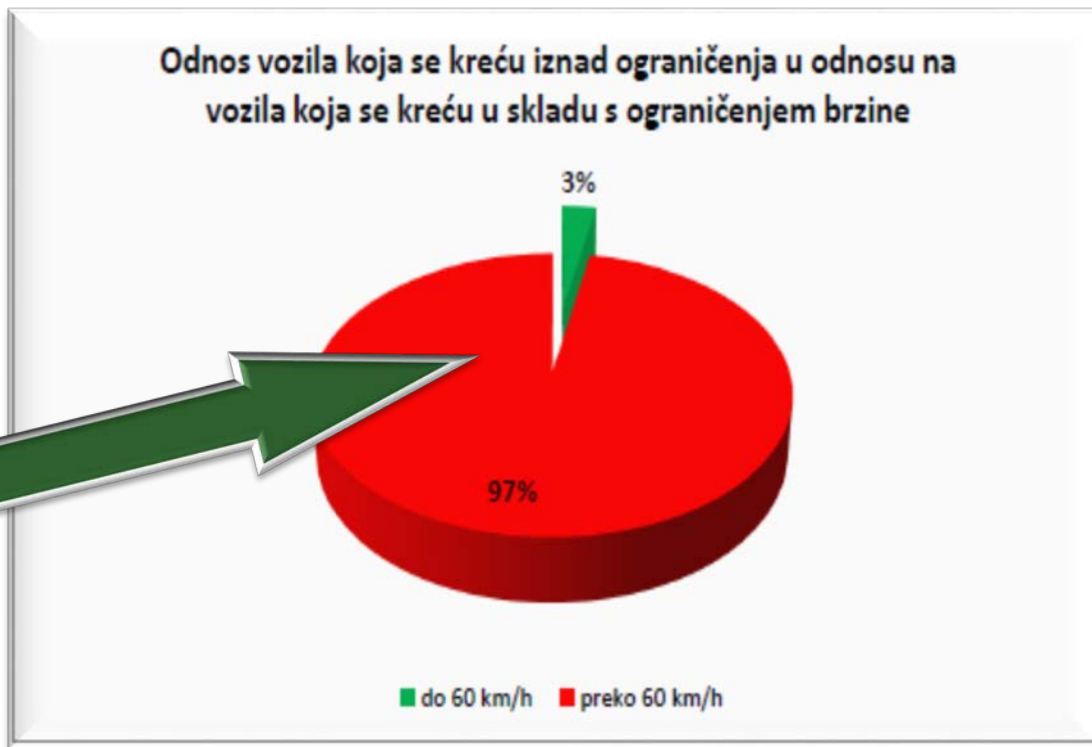
- Radarski uređaj
- ANPR
- Oba smjera
- 4 prometne trake



ANALIZA BRZINE PROMETNOG TOKA

A7 – Mihačeva Draga

- $V_{pr} = 80,4$ km/h
- $V_{max} = 155$ km/h



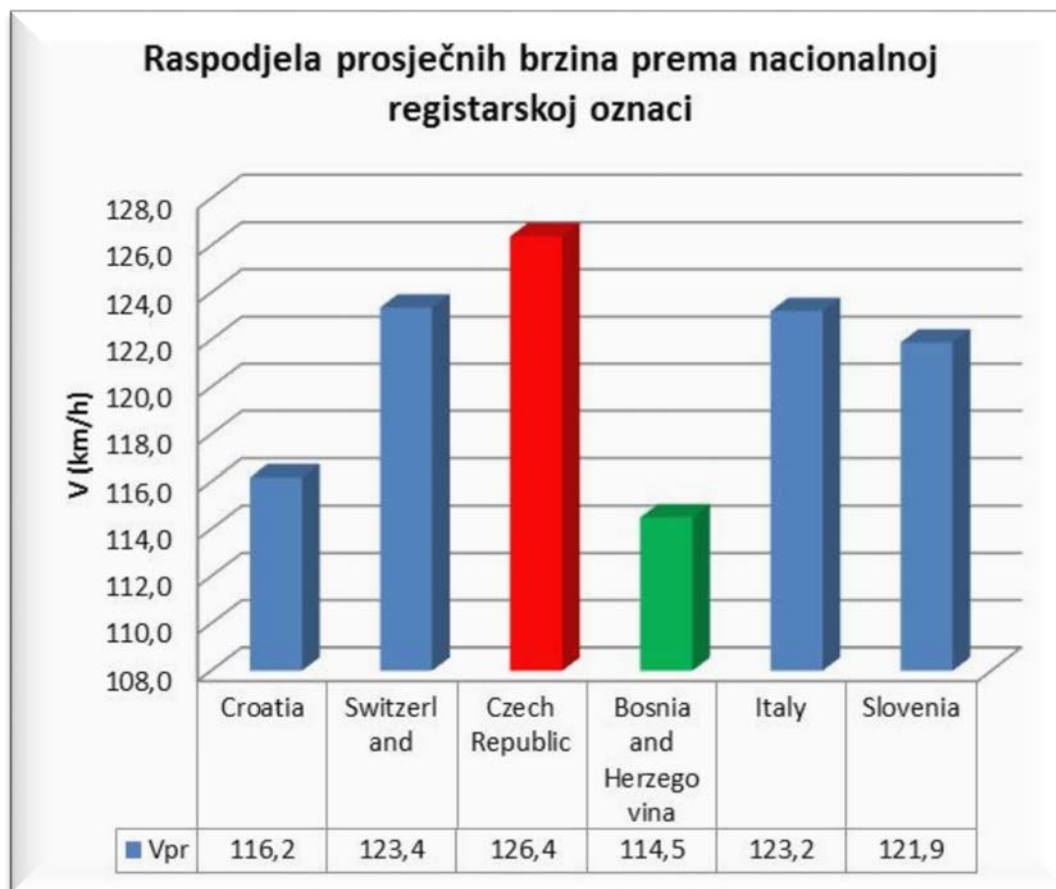
ANALIZA BRZINE PROMETNOG TOKA A1 – čvor Donja Zdenčina

- $V_{pr} = 116,6 \text{ km/h}$
- $V_{max} = 249 \text{ km/h}$

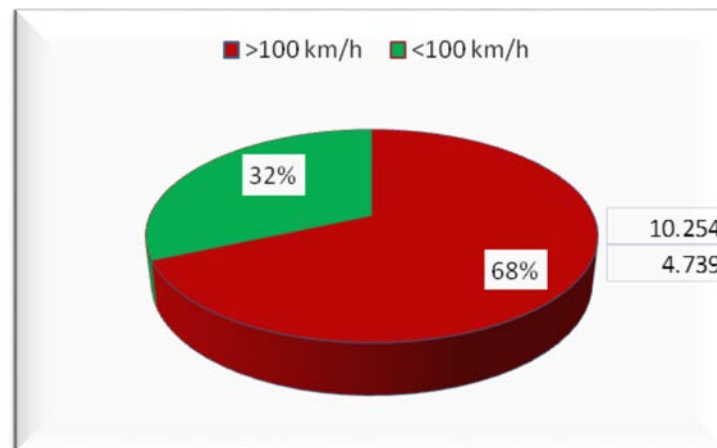
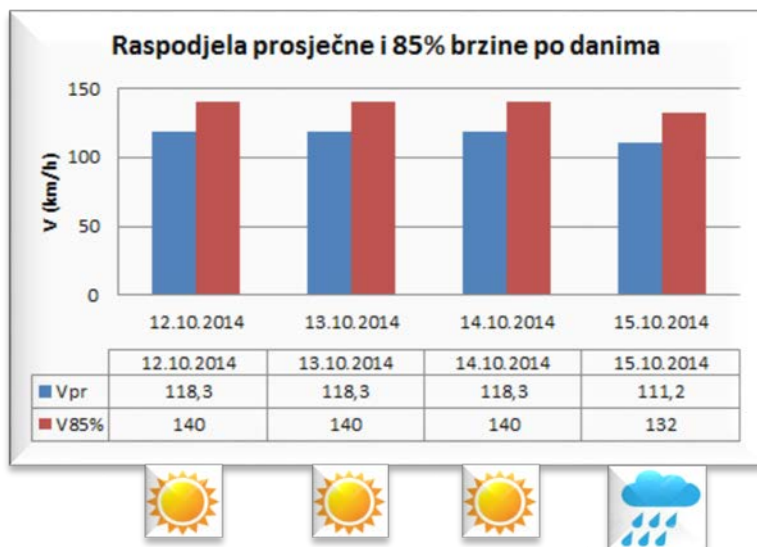


ANALIZA BRZINE PROMETNOG TOKA

A1 – čvor Donja Zdenčina



ANALIZA BRZINE PROMETNOG TOKA A1 – čvor Donja Zdenčina

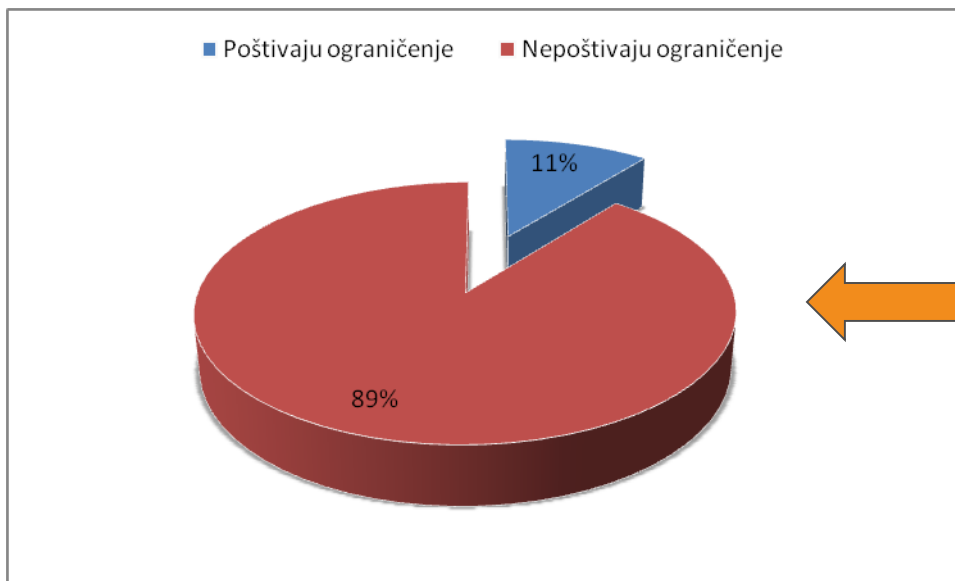





ANALIZA BRZINE PROMETNOG TOKA A6 – tunel Tuhobić

- $V_{pr} = 100 \text{ km/h}$
- $V_{max} = 196 \text{ km/h}$



30.01.2015.



00:00 - 08:12	
08:12-11:38	
11:38-17:02	
17:02-00:00	



EKSTREMNE BRZINE

Francuz projurio kraj Babine Grede 249 km/h

Presretač je u prvih sedam mjeseci ove godine na području PU vukovarsko-srijemske utvrdio 2110 slučajeva prekoračenja brzine.

f Svidi mi se Po dijeli 0 + Dijeli 0 Tweet 0

14 PREGLEDA

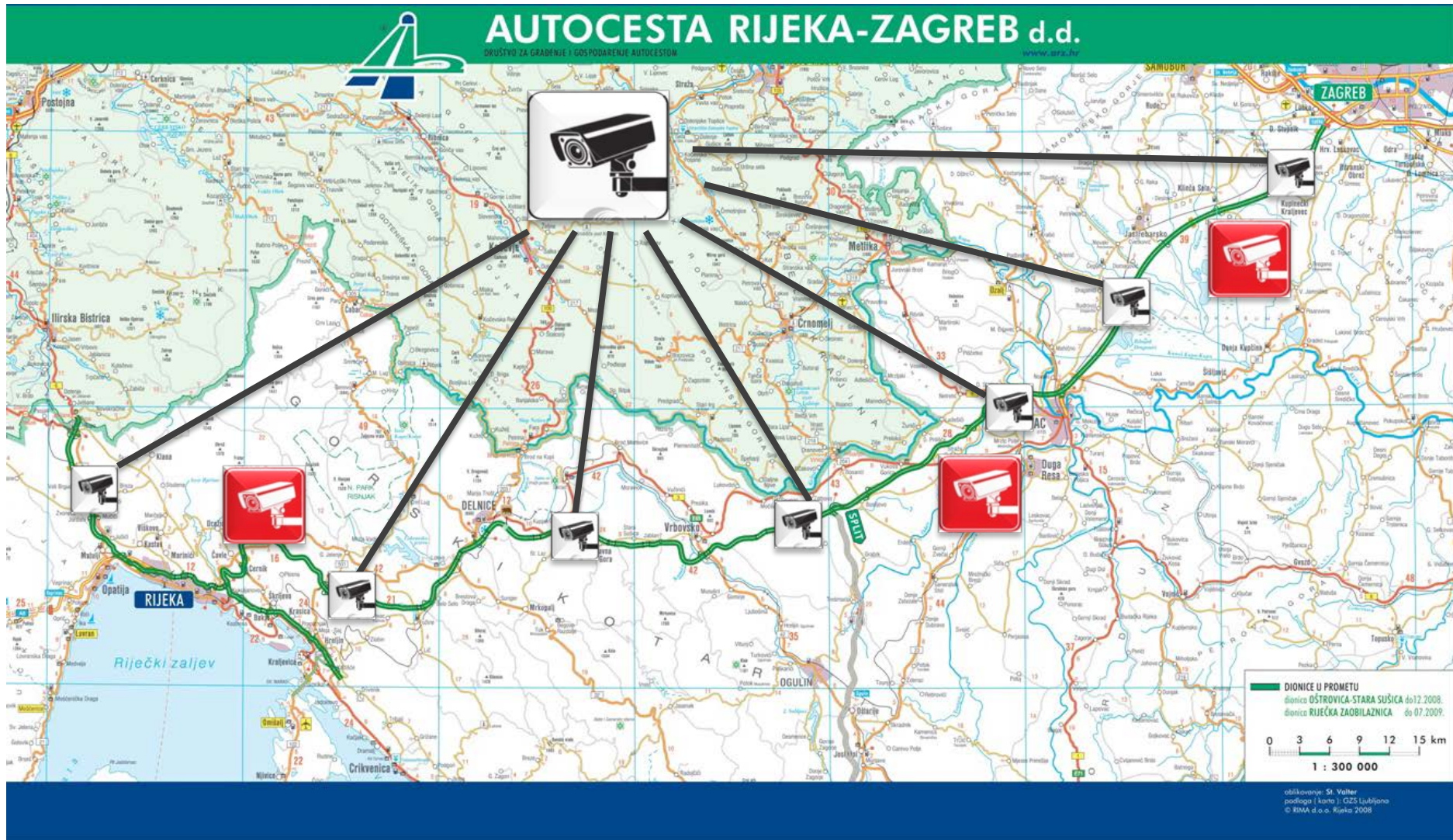


Presretač
210 dana – 2.110
10 dnevno

Kamera
4 dana – 1.472
368 dnevno



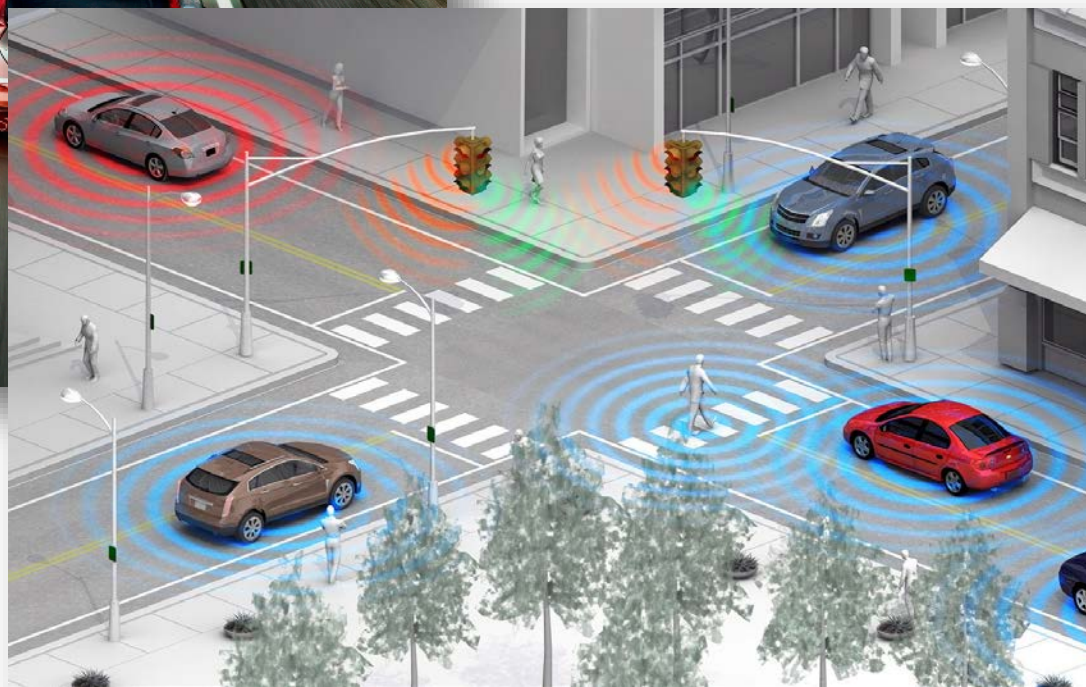
PILOT PROJEKT AUTOMATSKOG NADZORA BRZINE



PILOT PROJEKT AUTOMATSKOG NADZORA BRZINE



KAKO MOŽE (ILI ĆE) BITI?



AUTONOMNA VOZILA

Google driving to be driverless

Google's modified Toyota Prius uses an array of sensors to navigate public roads without a human driver. Other components, not shown, include a GPS receiver and an inertial motion sensor.

Laser-guided mapping

A rotating sensor with lasers called a LIDAR on the roof scans more than 200 feet in all directions to generate a precise three-dimensional map of the car's surroundings.

Position estimator

A sensor mounted on the left rear wheel measures small movements made by the car and helps to accurately locate its position on the map.

Video camera



A camera mounted near the rear-view mirror detects traffic lights and helps the car's onboard computers recognize moving obstacles—such as pedestrians and bicyclists.



Radar

Four standard automotive radar sensors, three in front and one in the rear, help determine the positions of distant objects.

Source: Google

NEW YORK TIMES; PHOTOGRAPHS BY RAMIN RAHIMIAN FOR THE NEW YORK TIMES

- Preko 10 god. testiranja
- > 500.000 km
- bez PN



AUTONOMNA VOZILA

RANK	0-4 YRS	5-14 YRS	15-29 YRS	30-44 YRS	45-69 YRS	70+ YRS	TOTAL
1	Perinatal causes	Lower respiratory infections	Road traffic injuries	HIV/AIDS	Ischaemic heart disease	Ischaemic heart disease	Ischaemic heart disease
2	Lower respiratory infections	Road traffic injuries	HIV/AIDS	Tuberculosis	Cerebrovascular disease	Cerebrovascular disease	Cerebrovascular disease
3	Diarrhoeal diseases	Malaria	Tuberculosis	Road traffic injuries	HIV/AIDS	Chronic obstructive pulmonary disease	Lower respiratory infections
4	Malaria	Drownings	Violence	Ischaemic heart disease	Tuberculosis	Lower respiratory infections	Perinatal causes
5	Measles	Meningitis	Self-inflicted injuries	Self-inflicted injuries	Chronic obstructive pulmonary disease	Trachea, bronchus, lung cancers	Chronic obstructive pulmonary disease
6	Congenital anomalies	Diarrhoeal diseases	Lower respiratory infections	Violence	Trachea, bronchus, lung cancers	Diabetes mellitus	Diarrhoeal diseases
7	HIV/AIDS	HIV/AIDS	Drownings	Lower respiratory infections	Cirrhosis of the liver	Hypertensive heart disease	HIV/AIDS
8	Whooping cough	Tuberculosis	Fires	Cerebrovascular disease	Road traffic injuries	Stomach cancer	Tuberculosis
9	Meningitis	Protein-energy malnutrition	War and conflict	Cirrhosis of the liver	Lower respiratory infections	Colon and rectum cancers	Trachea, bronchus, lung cancers
10	Tetanus	Fires	Maternal haemorrhage	Poisonings	Diabetes mellitus	Nephritis and nephrosis	Road traffic injuries
11	Protein-energy malnutrition	Measles	Ischaemic heart disease	Maternal haemorrhage	Self-inflicted injuries	Alzheimer and other dementias	Diabetes mellitus
12	Syphilis	Leukaemia	Poisonings	Fires	Stomach cancer	Tuberculosis	Malaria
13	Drownings	Congenital anomalies	Abortion	Nephritis and nephrosis	Liver cancer	Liver cancer	Hypertensive heart disease
14	Road traffic injuries	Trypanosomiasis	Leukaemia	Drownings	Breast cancer	Oesophagus cancer	Self-inflicted injuries
15	Fires	Falls	Cerebrovascular disease	Breast cancer	Hypertensive heart disease	Cirrhosis of the liver	Stomach cancer
16	Tuberculosis	Epilepsy	Diarrhoeal diseases	War and conflict	Nephritis and nephrosis	Inflammatory heart diseases	Cirrhosis of the liver
17	Endocrine disorders	Leishmaniasis	Falls	Falls	Oesophagus cancer	Breast cancer	Nephritis and nephrosis
18	Upper respiratory infections	Violence	Meningitis	Diarrhoeal diseases	Colon and rectum cancers	Prostate cancer	Colon and rectum cancers
19	Iron deficiency anaemia	War and conflict	Nephritis and nephrosis	Liver cancer	Poisonings	Falls	Liver cancer
20	Epilepsy	Poisonings	Malaria	Trachea, bronchus, lung cancers	Mouth and oropharynx cancers	Road traffic injuries	Violence

Source: WHO (2008), Global Burden of Disease: 2004 update.

1.240.000 POG – cestovni promet

1.000 POG – zračni promet *(zrakoplovi > 6 putnika)





Hvala na pažnji!

sbabic@arz.hr

