

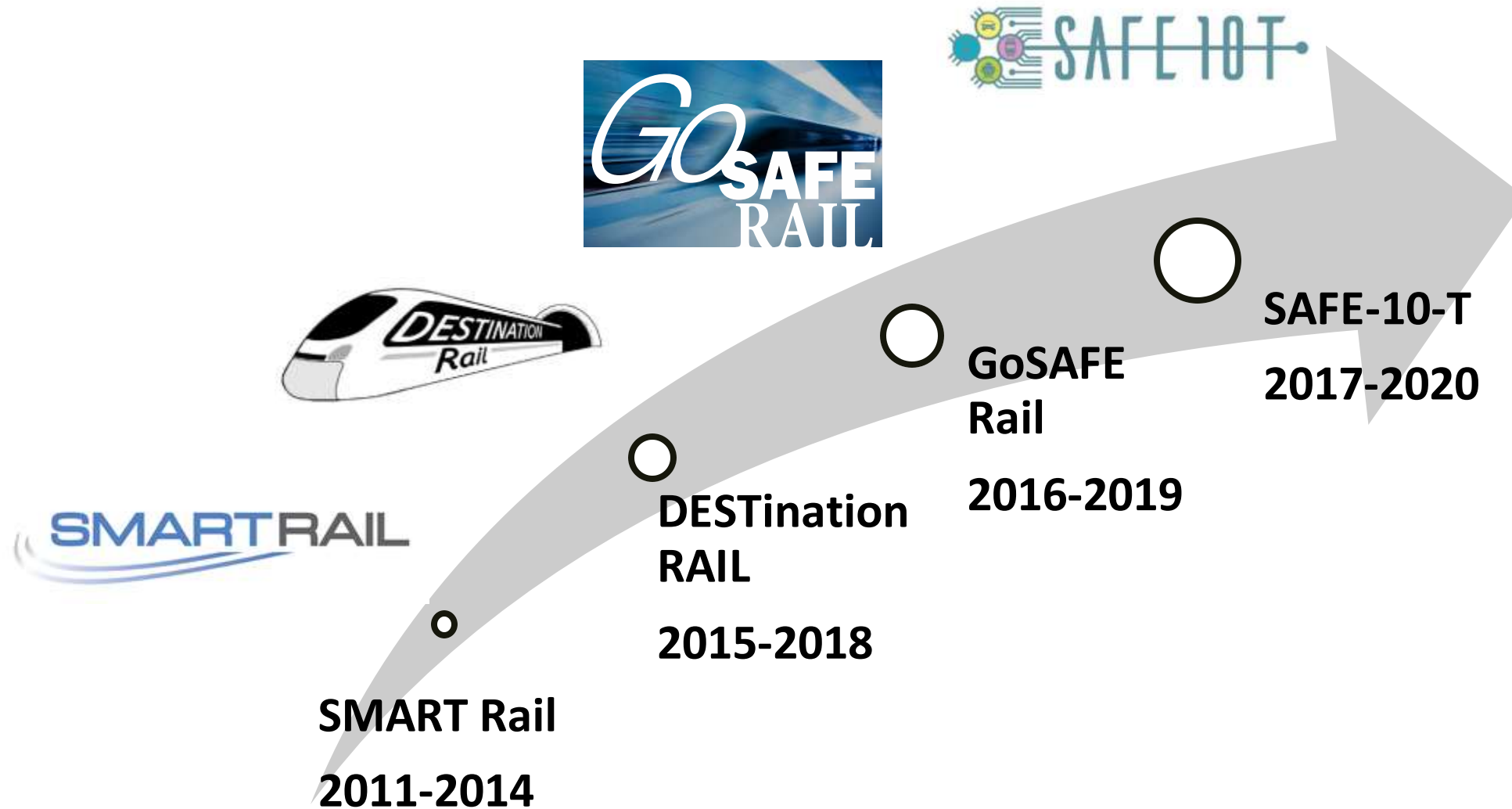
Iskustva u EU projektima za razvoj procjena rizika kritične infrastrukture

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INFRA PLAN konzalting, Zagreb, Hrvatska

Sadržaj

- Uvod
- Iskustva u EU projektima
- Primjeri hazarda
- Primjeri procjene rizika kritične infrastrukture
- Natječaji u sustavu civilne zaštite

Europski projekti 2011 - 2020





- 2011 – 2014 - FP 7 SMART RAIL “Smart Maintenance and Analysis of Railway Transport Infrastructure” (2.5 Mil EUR, 15 EU partners, WP leader) IGH → UT
- 2015 – 2018 - H2020 DESTination RAIL Decision Support Tool for Railway infrastructure Managers (4 Mil EUR, 3 Mil EUR EU funding, 15 EU partners, UT, WP leader)
- 2016 – 2019 – S2R project GoSAFE RAIL Global Safety Management Framework for Rail Operations (1.3 Mil EUR, WP leader, Infra Plan)
- 2017 - 2020 H2020 project SAFE-10-T Safety of Transport Infrastructure on the TEN-T Network (3 Mil EUR, 15 partners, WP leader, Infra Plan)



Primjeri hazarda

Utjecaj ekstremnih vremenskih uvjeta

Utjecaj na željezničku infrastrukturu



Podlokavanje željezničkog mosta, Hrvatska, 2009.



Irska - odronjavanje nasipa, 2007.



Vijadukt Malahide, linija Dublin - Belfast, 2009.

Primjeri utjecaja na kritičnu infrastrukturu



Smrzavanje kiše u Sloveniji
(grad Postojna), studeni
2013.

Klizište uzrokovano
poplavama, Bosna i
Hercegovina, 2014.



Primjeri utjecaja na kritičnu infrastrukturu



Smrzavanje kiše na električnim vodovima, Slovenija, 2014.



Primjeri utjecaja na cestovnu infrastrukturu



Poplava je uzrokovala rušenje jednog mosta koji je udario u drugi most, Zavidovići, Bosna i Hercegovina, 2014.

Poplavljeno čvorište na autocesti u lipnju 2013., Deggendorf, Njemačka



Primjeri utjecaja na cestovnu i željezničku infrastrukturu



Odroni kamenja uzrokovani jakim oborinama i visokim temperaturama – Hrvatska



Metodologija procjene rizika

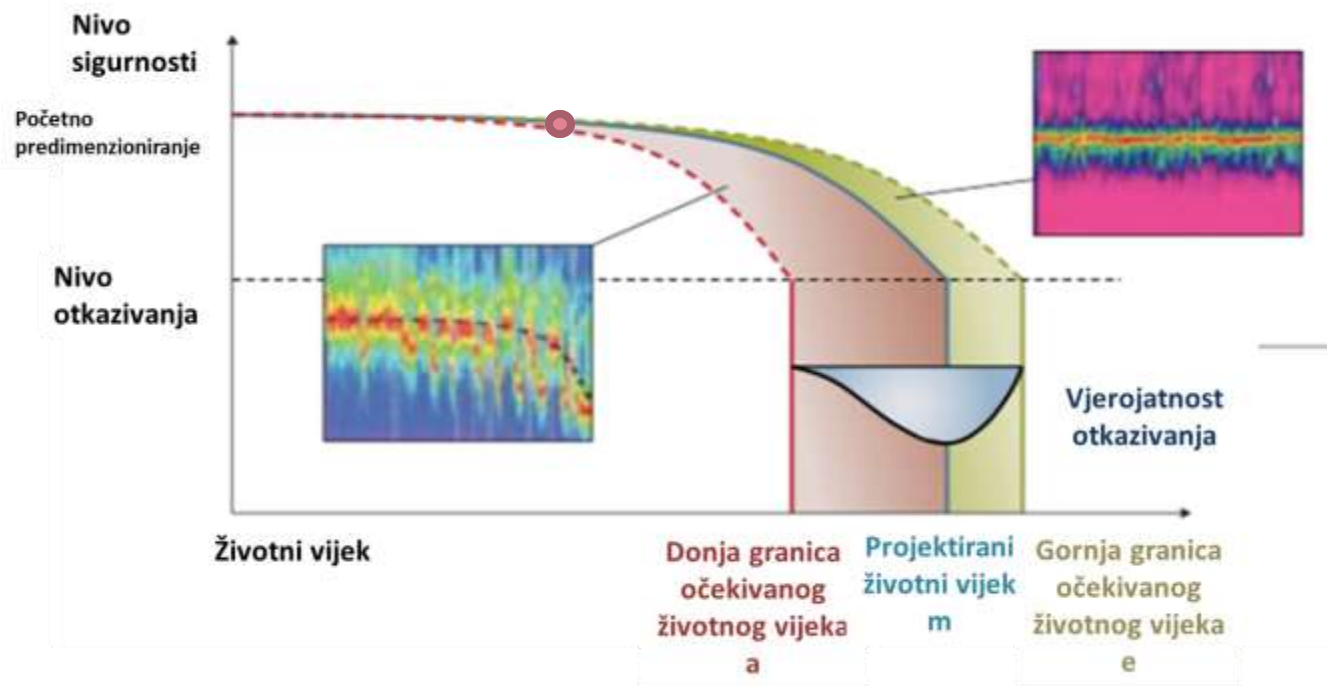
Funkcioniranje infrastrukturne mreže

BUDUĆNOST?

IMOVINA

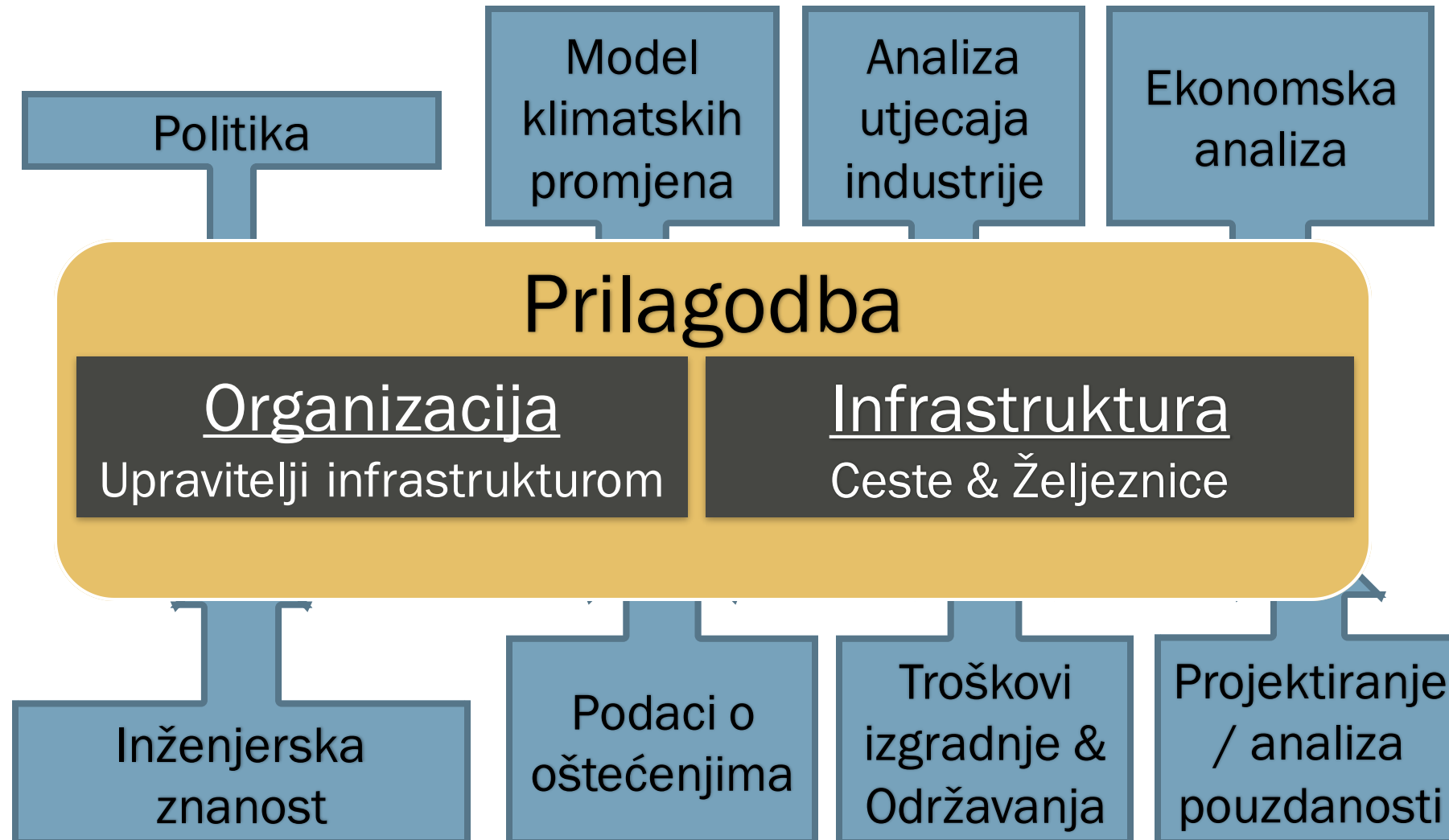
Zemljopisna lokacija →
okoliš, intenzitet
prometa

Starost, geometrija,
stanje



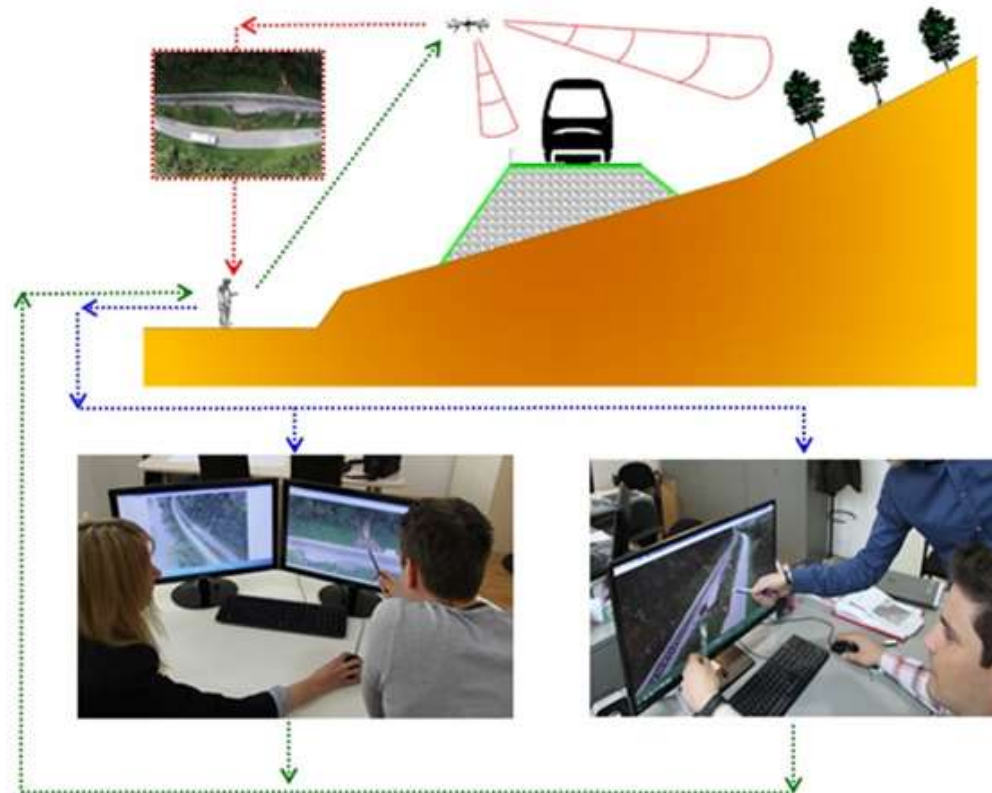
$$\text{Rizik} = p_f * \text{posljedica}$$

Metodologija: Top-down & Bottom-up



Ocjena stanja postojeće infrastrukture

- Ocjena stanja infrastrukture jedan od temelja izrade procjene rizika za određeno područje





Primjeri dobre prakse

DESTination RAIL projekt

www.destinationrail.eu



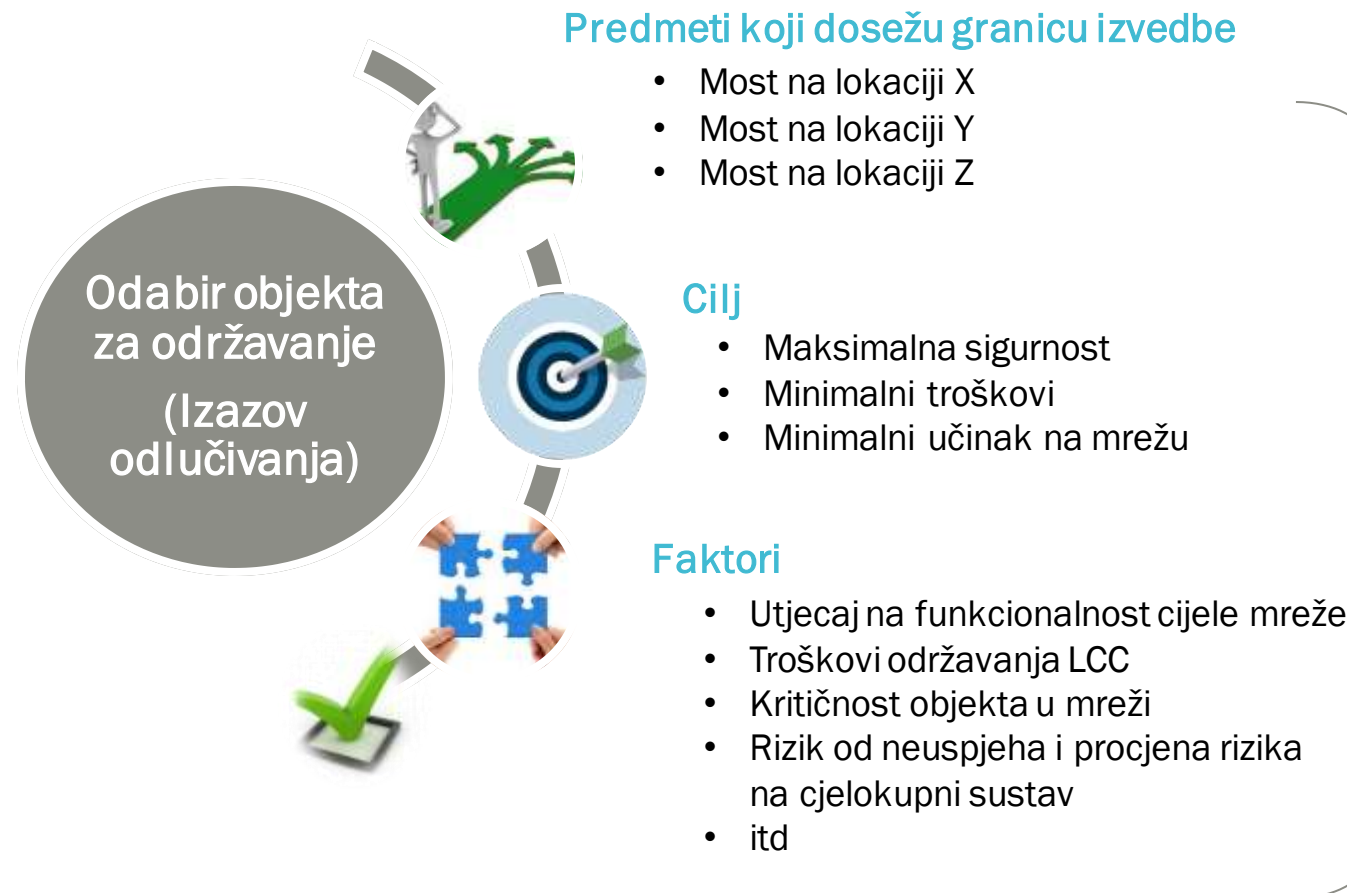
DESTiNation Rail



- Alat za podršku u odlučivanju (DST) za vlasnike željezničke infrastrukture
- Optimiziranje troškova održavanja infrastrukture
- Financirano iz programa Horizon 2020
- 3 godine od svibnja 2015. do travnja 2018.
- 16 partnera iz 8 EU zemalja
- Hrvatska:
 - *Građevinski fakultet Sveučilišta u Zagrebu*
 - *HŽ Infrastruktura*



Postupak održavanja željeznice



Presude i zapažanja
menadžera infrastrukture (subjektivno)

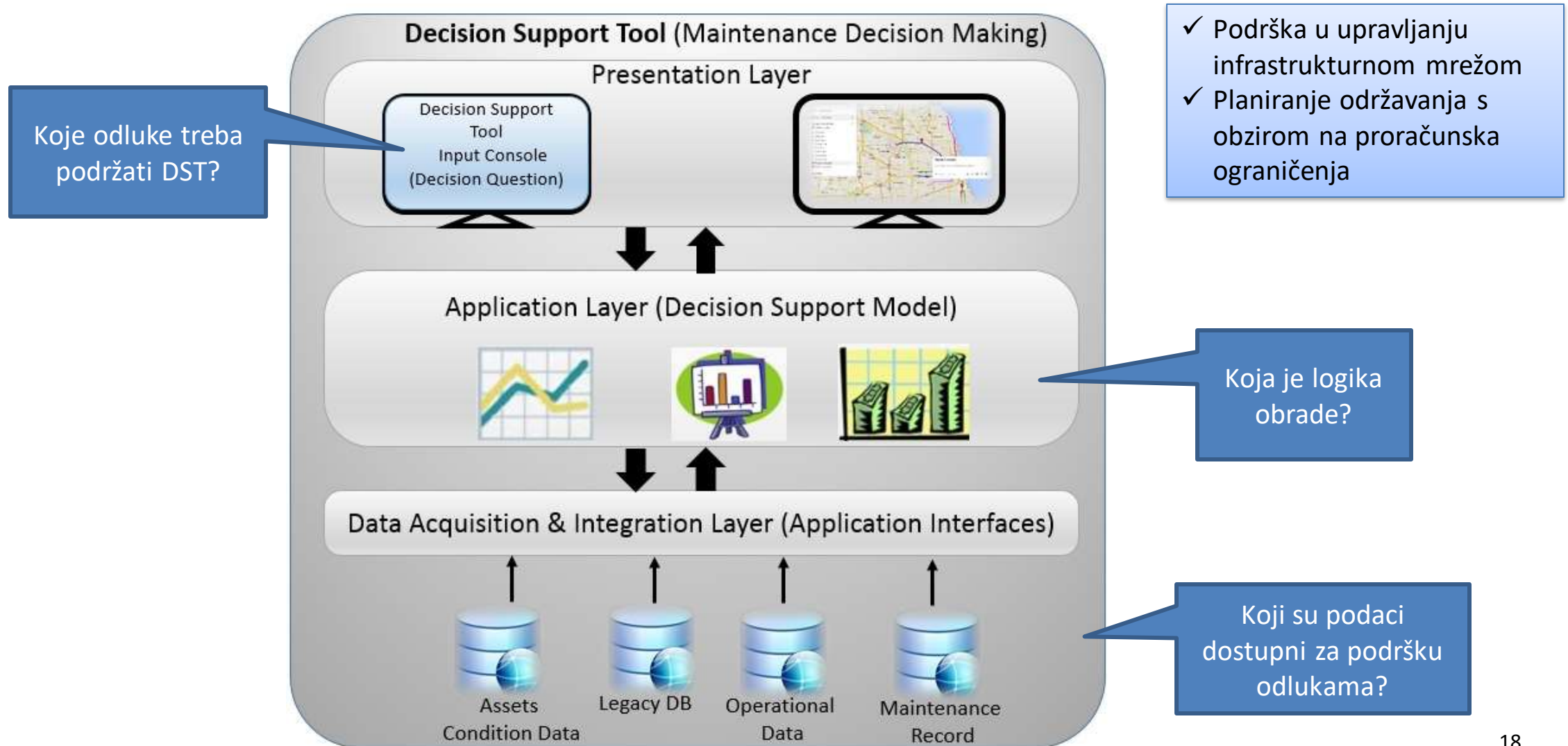
Urušavanje vijadukta Malahide



- Potreba za podacima
- Potreba za modelima pouzdanosti
- Potreba za alatom za podršku u procesu odlučivanja

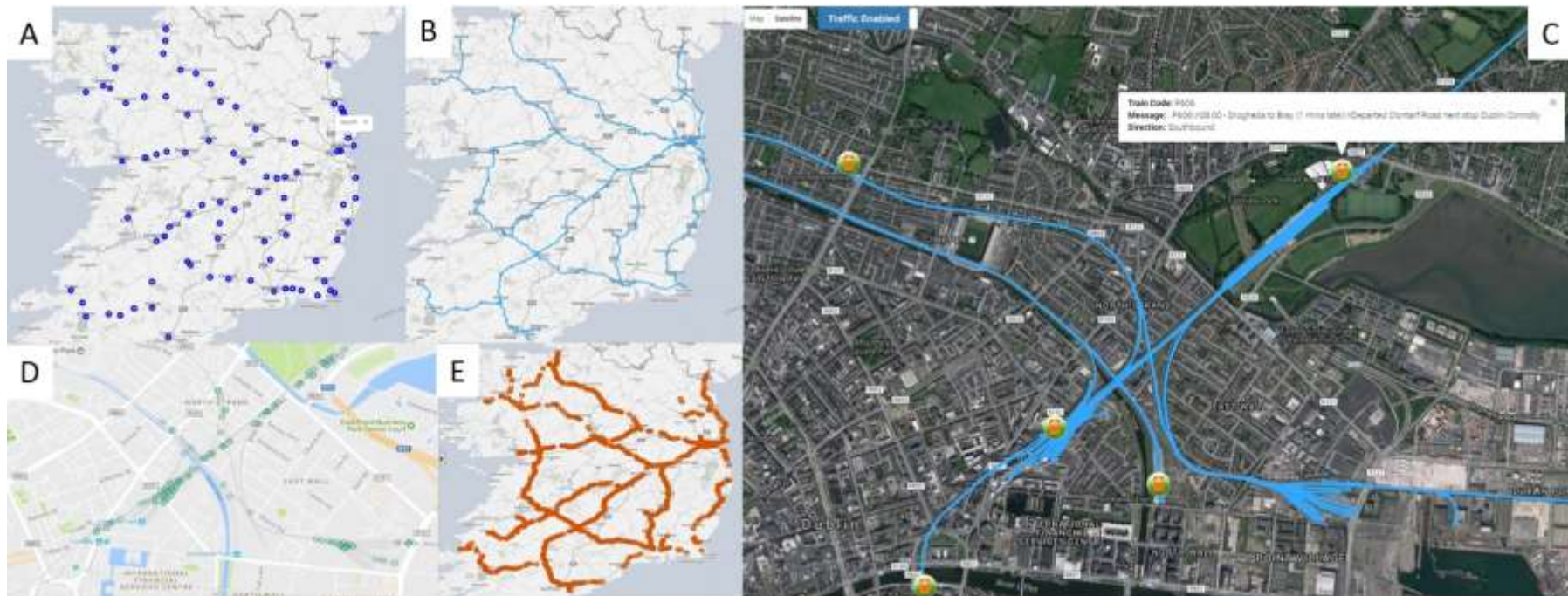


Decision Support Tool



Alat za podršku odlučivanju - Decision support Tool (DST)

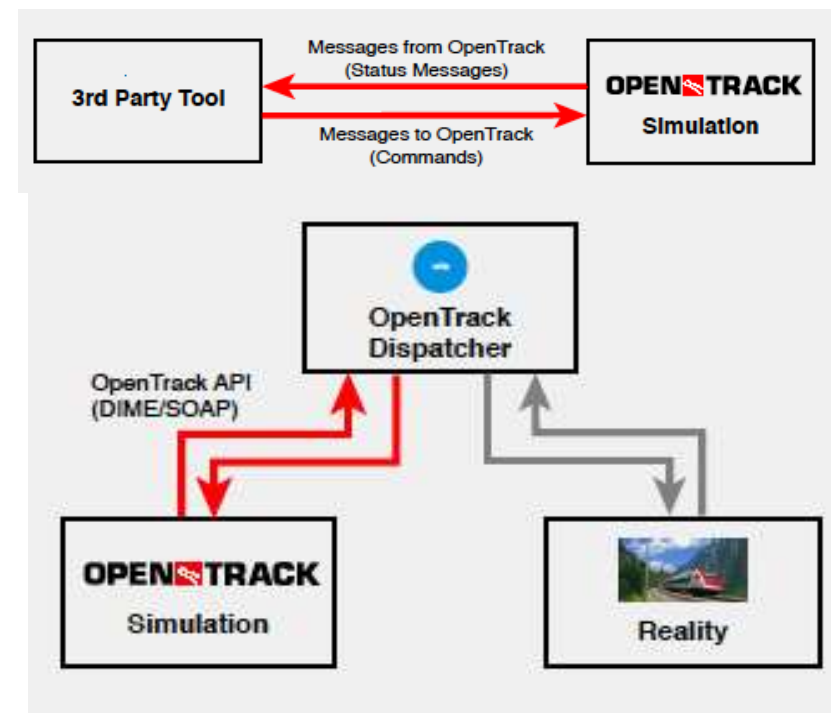
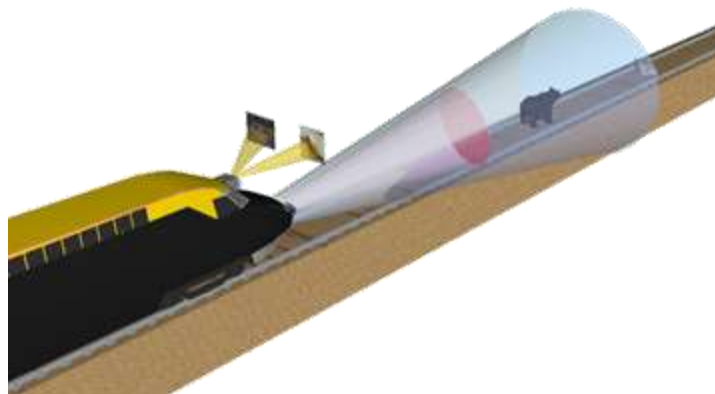
Mrežni modeli



GoSAFE RAIL project

Global Safety Management Framework for Rail Operations

- Safety + Mobility
- Object detection and micro-mobility planning



Near Miss concept – ML models

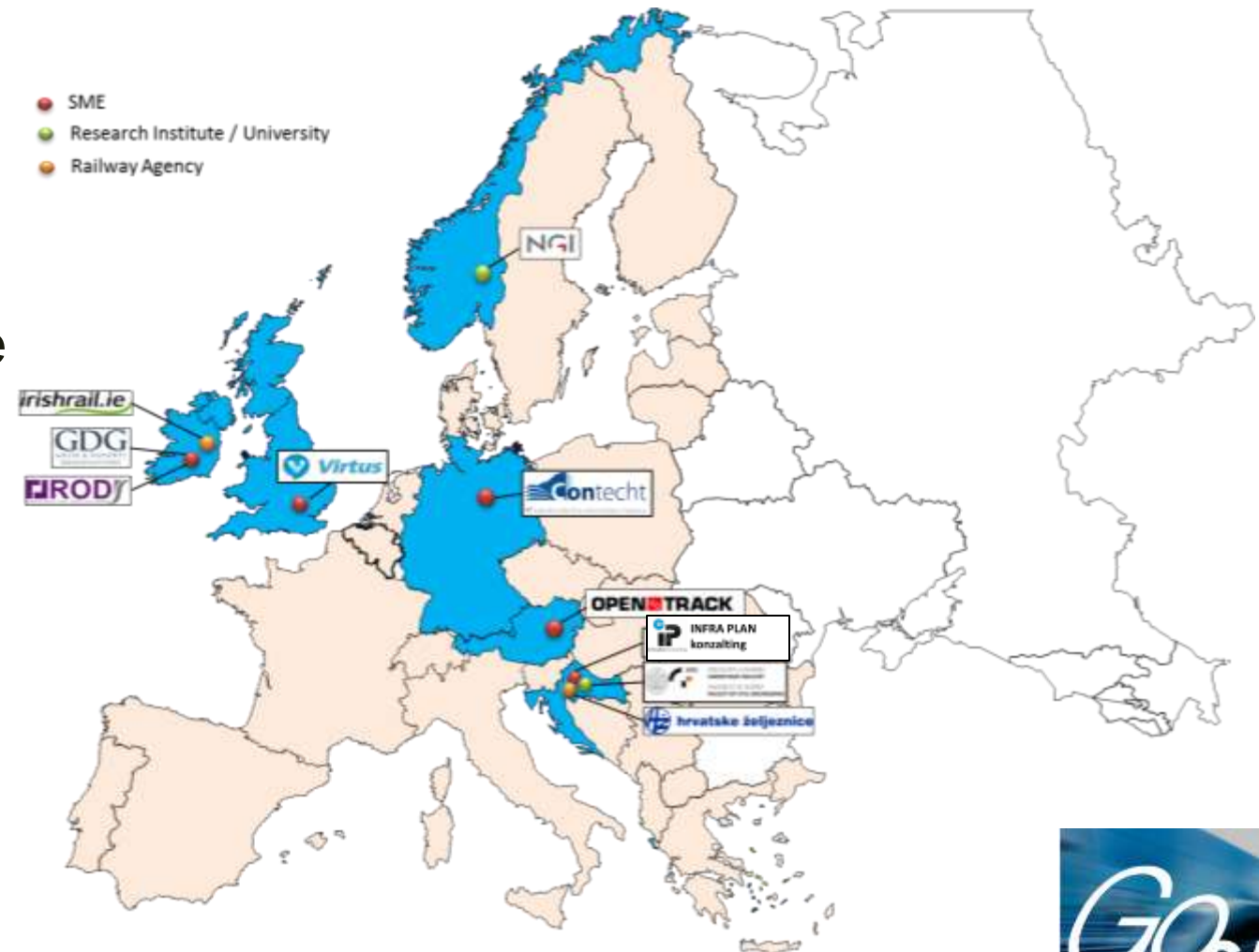


Incident Ratio Model –
Heinrich's Triangle



Konzorcij

- 6 SME
- 1 sveučilište
- 1 institut
- 2 vlasnika infrastrukture



<http://www.gosaferail.eu>



SAFE-10-T

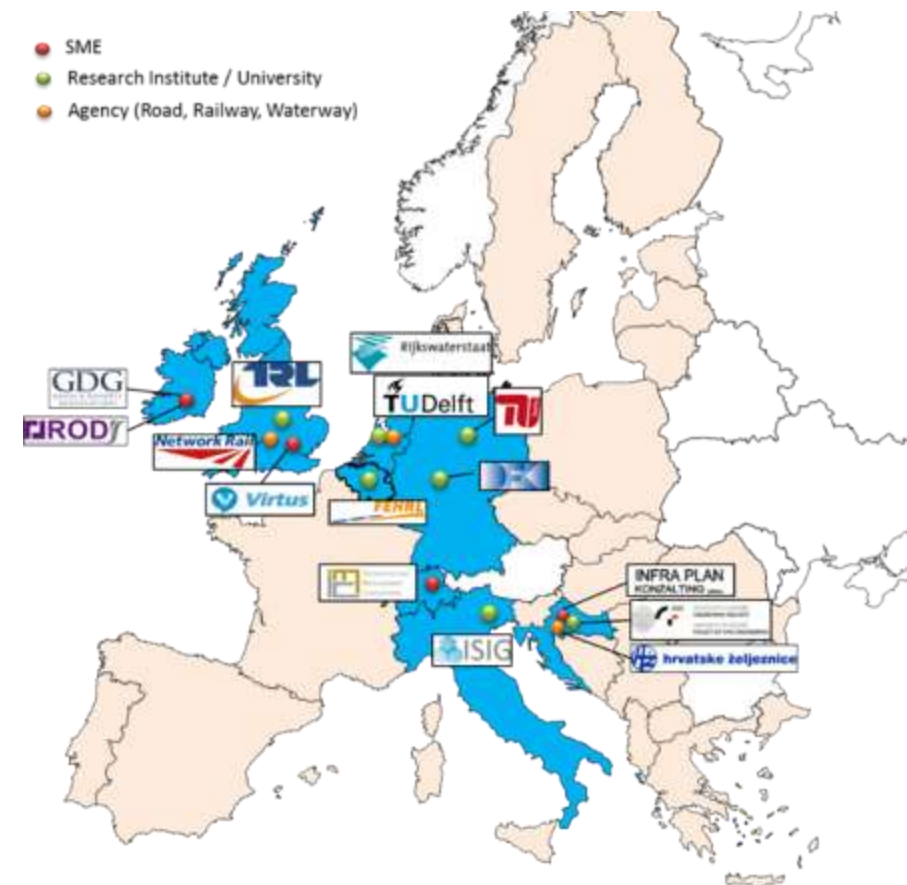
Multi-modal approach



Konzorcij

<http://www.safe10tproject.eu/>

- 5 SME
- 3 sveučilišta
- 2 instituta
- 1 udruženje
- 3 vlasnika infrastrukture



GDG

IROD

TU Delft

Ministerstvo
Infrastrukture
i Prometa

Network Rail

Virtus IT

INFRASTRUCTURE
MANAGEMENT
CONSULTANTS

INSTITUT ZA PROMET
I PROMETNI
POSREDOVANJE

HŽ INFRASTRUKTURA

IP
infra plan konzalting

TU
berlin

DFK
Deutsches
Forschungszentrum
für Künstliche
Intelligenz GmbH

ISIG

FEHRL

Natječaji s GZ UHS

- Risk Based Approach to Management of Combined **CY**ber Security and **PH**ysical ThrEats To Rail Infrastructure **CYPHER**

– *Evaluacija u tijeku*

Part. No. *	Participant organisation name	Short Name	Type	Country
1 (Coordinator)	Technische Universiteit Delft	TUD	HEI	Netherlands
2	Safety Region Of South Holland (Veiligheidsregio Zuid-Holland Zuid)	VRHZ	PUB	Netherlands
3	Deltares	DEL	RES	Netherlands
4	IG	IG	SME	Netherlands
5	Deutsche Bahn	DB	PUB	Germany
6	Leibniz University Of Hannover	UH	HEI	Germany
7	Trafikverket	TKV	PUB	Sweden
8	University Of Lulea	LTU	HEI	Sweden
9	Société nationale des chemins de fer français (French National Railway Company)	SNCF	PUB	France
10	Ecole des Ponts ParisTech ENPC	ENPC	HEI	France
11	Infra Plan Konzalting	IPK	SME	Croatia
12	Hrvatske Željeznice Infrastruktura (Croatian Railways Infrastructure)	HZI	PUB	Croatia
13	University Of Zagreb Faculty Of Civil Engineering	UZ	HEI	Croatia
14	Voestalpine Signalling	VS	SME	Austria
15	Austrian Institute Of Technology	AIT	RES	Austria
16	TrenoLab	TL	SME	Italy
17	University of Warwick	UW	HEI	United Kingdom
18	Safetech Innovations	STI	SME	Romania
19	Fenix TNT	FEN	SME	Czech Republic
20	City Of Zagreb, Office For Emergency Management	OEM	PUB	Croatia
21	Institute For Sociology	ISIG	HEI	Italy

- Multi hazard assessment and **RISK MAN**agement in highly populated urban areas in Southern Eastern Europe (**RISKY MAN**)

– *Nije prošao*

N.	Proposer name	Country
1	GRAD ZAGREB	HR
2	SVEUCILISTE U ZAGREBU GRADEVINSKI FAKULTET	HR
3	INFRA PLAN KONZALTNIG JDOO ZA USLUGE	HR
4	ZAVOD ZA GRADBENISTVO SLOVENIJE	SI
5	MUNICIPALITY OF LJUBLJANA	SI
6	Javna vatrogasna postrojba Grada Zagreba	HR
7	GASILSKA BRIGADA LJUBLJANA	SI
8	CENTRO EUROPEO DI FORMAZIONE E RICERCA IN INGEGNERIA SISMICA	IT
9	Croatian Academy of Engineering	HR

Hvala na pažnji!

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<http://www.destinationrail.eu/>

<http://www.safe10tproject.eu/>

<http://www.gosaferail.eu>