

ITAWTC 2015

LACROMA VALAMAR CONGRESS CENTER
DUBROVNIK, CROATIA



**MINISTRY OF MARITIME
AFFAIRS, TRANSPORT
AND INFRASTRUCTURE**

Dražen ANTOLOVIĆ

Croatia

May 22-28, 2015

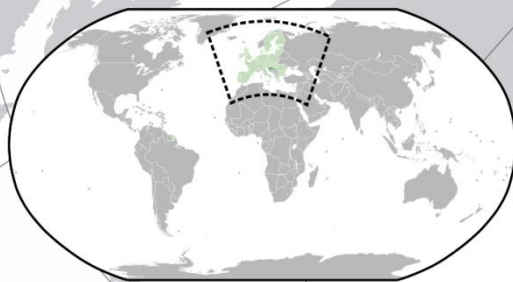
Plans of using underground space in development of road and rail infrastructure of Republic of Croatia

Operation and Maintenance of Tunnels and
Underground Structures



Contents:

1. Info about Croatia
2. Road tunnels network
3. Railway tunnels network
4. Transport infrastructure planning
5. Conclusion



Basic information:

- Land area: 56 594 km²
- Population: 4.4 million
- EU member: since 2013
- Territorial Organization: 20 counties and the City of Zagreb
- Capital: Zagreb
- Climate: Continental and Mediterranean



1. Info about Croatia



Excellent location

- very favorable geographical location.
- **the shortest and the fastest route** between Western Europe and Asia
- and between Eastern Europe and the Mediterranean.
- three out of ten Pan-European transport corridors pass through Croatia.

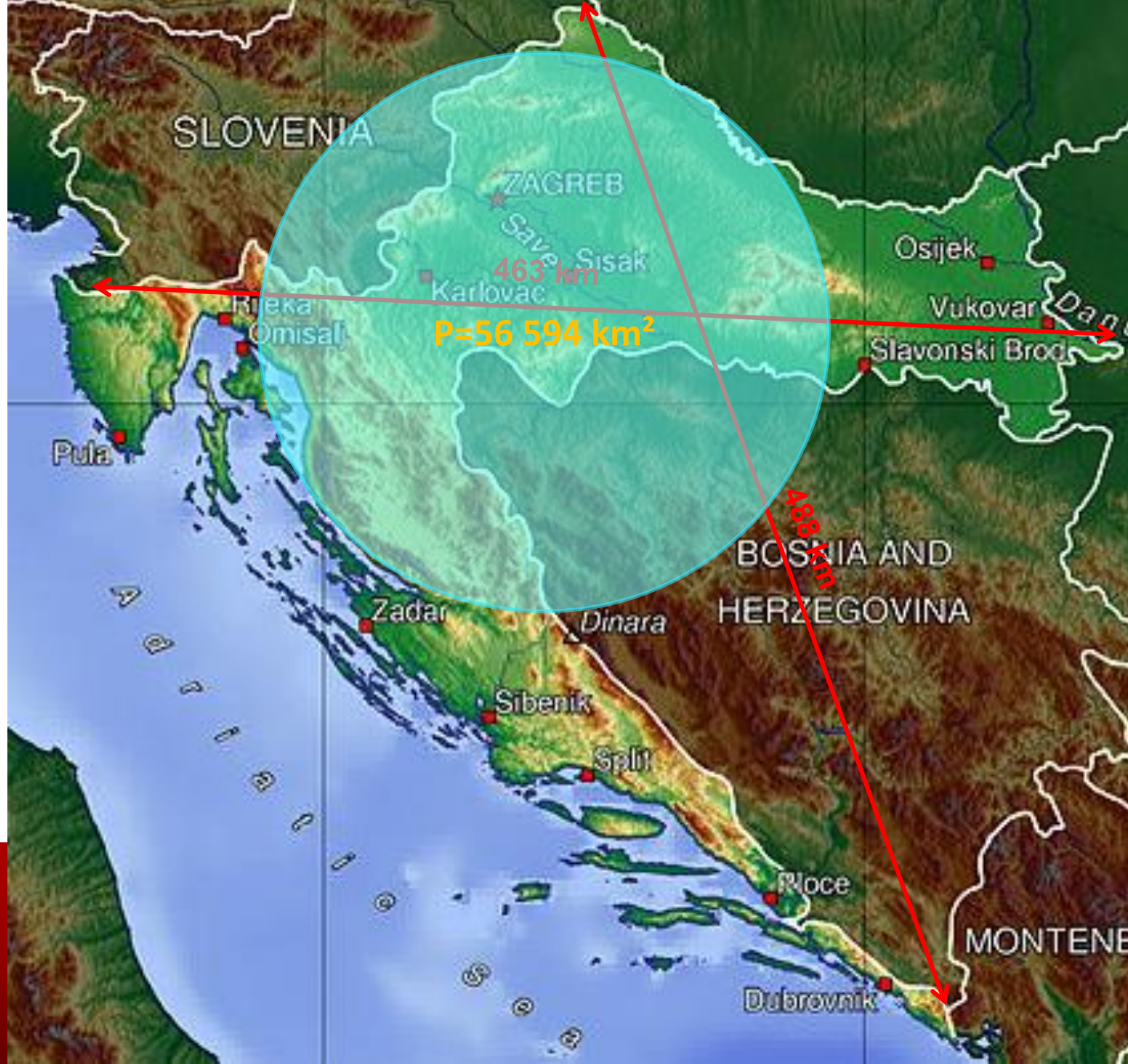


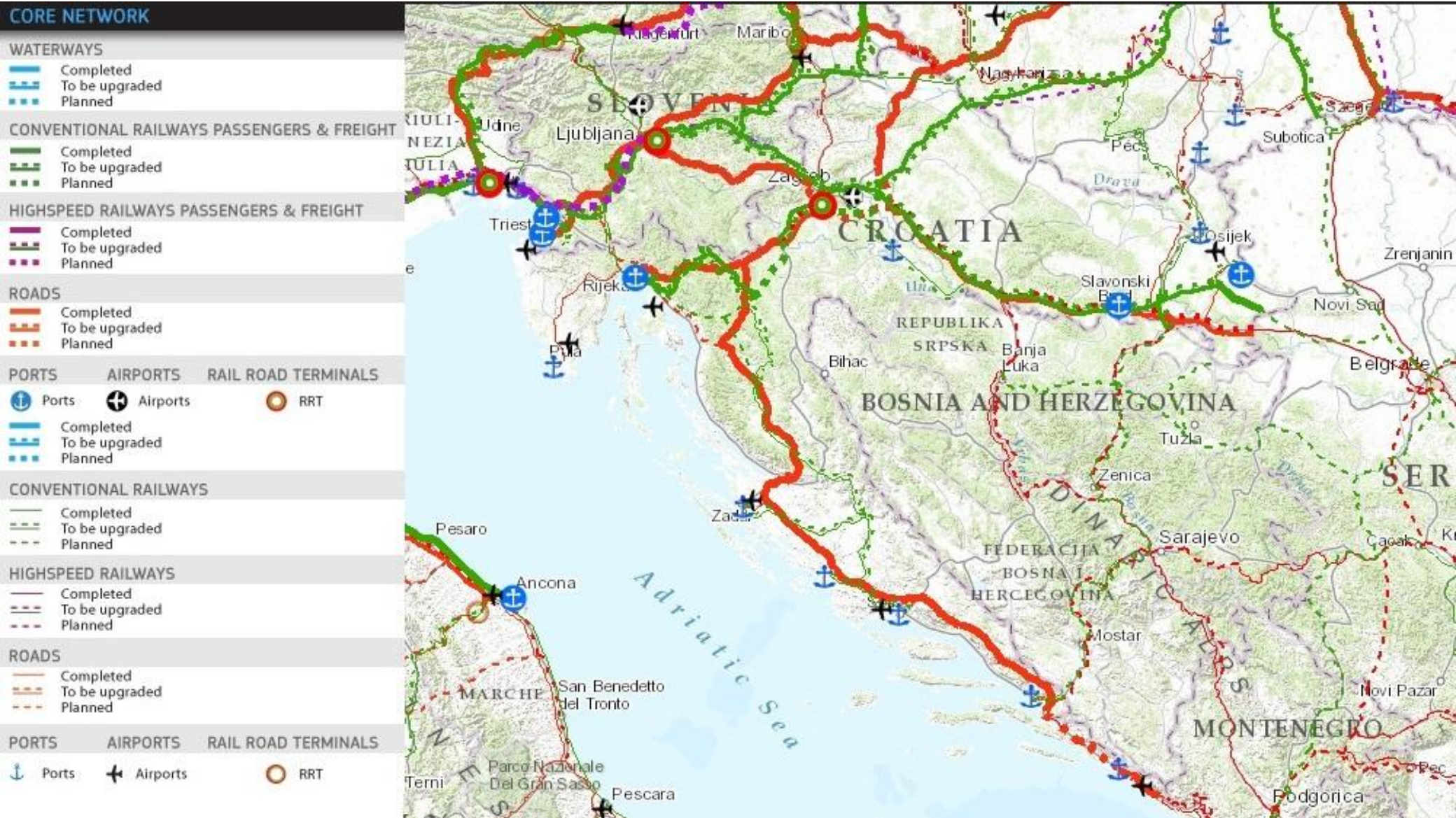
1. Info about Croatia – Geotransport location



Geographic info:

- Borders: 2.237 km
- Costal line: 1.777 km
- Most of Croatia is lowlands (north)
- High elevations (costal and south region)



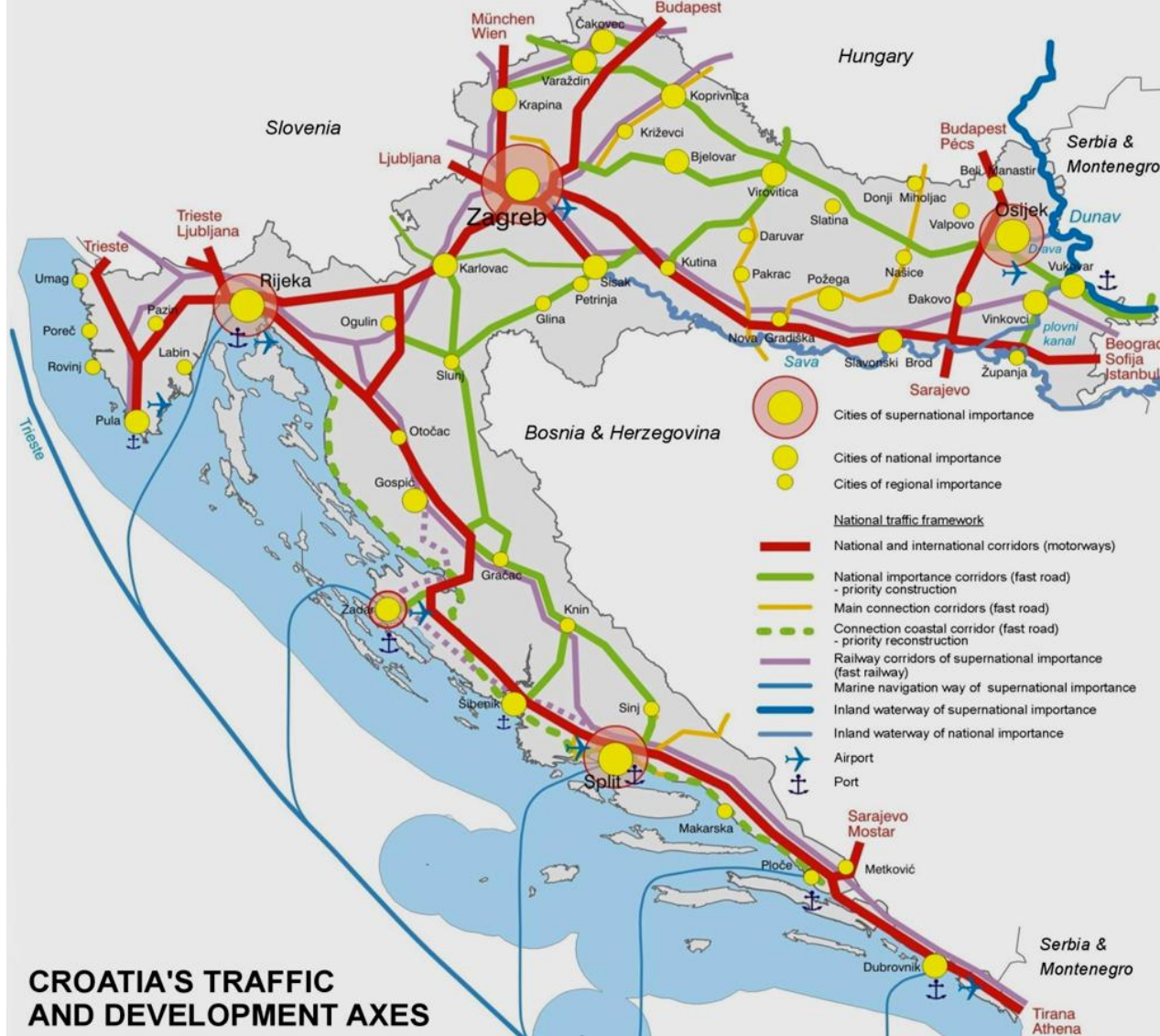


1. Info about Croatia – TEN-T Corridors



Key transport infrastructure in Croatia:

- Public roads: 26.864 km
- Highways: 1.420 km
- State roads: 6.913 km
- Railways: 2.605km
- Sea ports: 6 (main)
- IWW: 804 km
- IWW ports: 4
- Airports: 7 (int.)



1. Info about Croatia – transport infrastructure



Basic info:

- 5 road operators
- 34 tunnels over 500 m
- 3 tunnels over 3.000 m



RED. BR.	NAZIV TUNELA	DULJINA CIJEVI 1 (m)	DULJINA CIJEVI 2 (m)	UKUPNA DULJINA DULJINA CIJEVI TUNELA(m)	BROJ CIJEVI
1	Mala Kapela	5.780,00	5.822,00	11.602,00	2
2	Brinje	1.560,00	1.561,00	3.121,00	2
3	Plasina	2.300,00	2.300,00	4.600,00	2
4	Grič	1.253,00	1.235,00	2.488,00	2
5	Sv. Rok	5.698,10	5.767,00	11.465,10	2
6	Leđenik	768,00	752,40	1.520,40	2
7	Bristovac	700,30	656,90	1.357,20	2
8	Dubrave	837,50	868,50	1.706,00	2
9	Konjsko	1.133,80	1.261,70	2.395,50	2
10	Bisko	524,90	517,90	1.042,80	2
11	Stražina	611,20	613,40	1.224,60	2
12	Šušbir	962,00	825,00	1.787,00	2
13	Sv. Tri Kralja	1.740,00		1.740,00	1
14	Brezovica	590,00		590,00	1
15	Hrastovec	545,00	498,00	1.043,00	2
16	Vrtlinovec	522,00	628,00	1.150,00	2
17	Tuhobić	2.143,00	2.142,00	4.285,00	2
18	Sleme	858,00	837,00	1.695,00	2
19	Sopač	775,00	740,00	1.515,00	2
20	Lučice	590,00	581,00	1.171,00	2
21	Vršek	859,00	865,00	1.724,00	2
22	Javorova Kosa	1.490,00	1.450,00	2.940,00	2
23	Pod Vugleš	595,00	590,00	1.185,00	2
24	Čardak	601,00	601,00	1.202,00	2
25	Rožman Brdo	508,00	528,00	1.036,00	2
26	Veliki Gložac	1.126,00	1.130,00	2.256,00	2
27	Škurinje 2	575,00	575,00	1.150,00	2
28	Trsat	854,00	839,00	1.693,00	2
29	Burlica	728,00	718,00	1.446,00	2
30	Učka	5.062,00		5.062,00	1
31	Mravinci	563,00	563,00	1.126,00	2
32	Pećine	1.345,00		1.345,00	1
33	Mali Prolog	545,00	498,00	1.043,00	2
34	Kobiljača	780,00	832,00	1.612,00	2
		UKUPNA DULJINA CIJEVI SVIH TUNELA (m)		82.318,60	

2. Road tunnels network



Regulation on tunnel safety:

- Road act (NN 84/11, 22/13, 54/13, 148/13, 92/14)
- Directive on minimum safety requirements for tunnels in the TEN-T road network (2004/54/EC) – implemented in national law
- Law of Fire-prevention (NN 92/10)
- Law of Fire-fighting
- Law of protection and safety
- Decision on determining parking spaces and limitations on public roads for ADR transport (NN 114/12)
- Regulation on Classification of buildings, building parts and spaces into categories of fire risk (NN 62/94, 32/97)

2. Road tunnels network – tunnel safety



Fire prevention in highway tunnels:

- Tunnels on TEN-T highway are organized in 13 groups,
- According regulation 2 tunnels are in IIA, 3 tunnels are in IIB and 6 tunnels are in IF risk category.

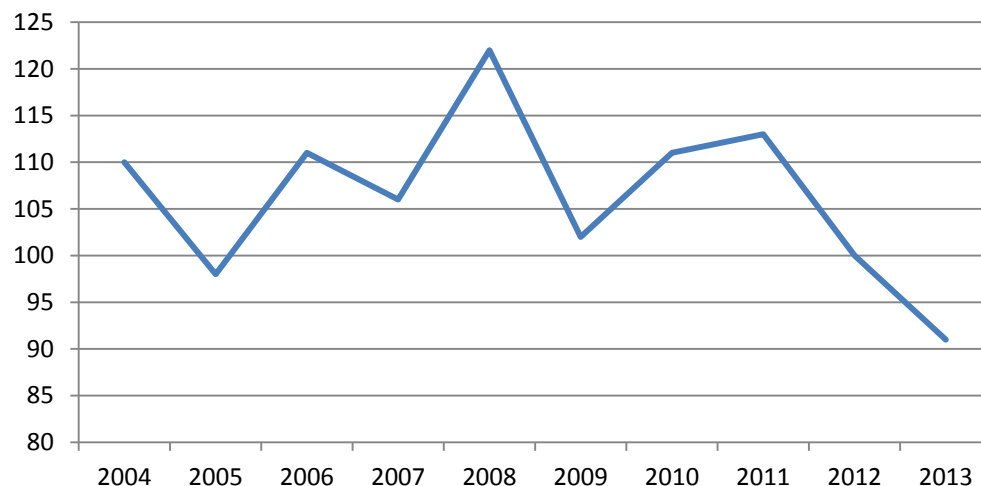
FIRE PROTECTION ON HIGHWAY TUNNELS DATA

Total tunnel length (m)	Minimum fire-fighters	Existing fire-fighters	Fire-fighting vehicles	Total annual cost:	Cost per m
50.693 m	144	207	33	4.883.901 EUR	96 EUR

2. Road tunnels network – tunnel safety



Traffic Accidents in tunnels



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Traffic Accidents	110	98	111	106	122	102	111	113	100	91
Accidents with casualties	26	20	37	25	41	31	29	30	28	27
Accidents with injuries	25	19	33	22	40	29	29	29	27	27
Fatal accidents	1	1	4	3	1	2	0	1	1	0
People died	2	2	7	5	1	2	0	1	1	0
Seriously injured people	10	14	10	10	12	8	5	8	4	7
Easier injured people	36	29	54	28	48	35	38	36	33	35

2. Road tunnels network – tunnel safety

	Tunnel	Tube 1 (m)	Tube 2 (m)	Road	Tunnel Manager	2012. (year)				2013. (year)			
						ACCIDENT (no fire)	ACCIDENT (with fire)	SEROIOUSLY INJURED	FATAL INJURED	ACCIDENT (no fire)	ACCIDENT (with fire)	SEROIOUSLY INJURED	FATAL INJURED
1.	Mala Kapela	5.780	5.822	A1	HAC	6	0	1	0	2	1	0	0
2.	Brinje	1.560	1.561	A1	HAC	4	0	0	0	1	0	1	0
3.	Plasina	2.300	2.300	A1	HAC	7	1	0	0	6	1	0	0
4.	Grič	1.253	1.235	A1	HAC	3	0	0	0	4	0	0	0
5.	Sv. Rok	5.698	5.767	A1	HAC	3	2	0	0	5	2	0	0
6.	Ledenik	768	752	A1	HAC	1	0	0	0	0	0	0	0
7.	Bristovac	700	657	A1	HAC	2	0	0	0	0	0	0	0
8.	Dubrave	838	869	A1	HAC	0	0	0	0	2	0	0	0
9.	Konjsko	1.134	1.262	A1	HAC	2	0	0	0	0	0	0	0
10.	Bisko	525	518	A1	HAC	0	0	0	0	2	0	0	0
11.	Stražina	611	613	A1	HAC	1	0	0	0	1	0	0	0
12.	Šubir	962	825	A1	HAC	0	0	0	0	0	0	0	0
13.	Sv. Tri Kralja	1.740	-	A2	AZM	0	0	0	0	1	0	0	0
14.	Brezovica	590	-	A2	AZM	0	0	0	0	0	0	0	0
15.	Hrastovec	545	498	A4	HAC	0	0	0	0	0	0	0	0
16.	Vrtlinovec	522	628	A4	HAC	0	0	0	0	0	0	0	0
17.	Tuhobić	2.143	2.142	A6	ARZ	1	0	0	0	1	0	0	0
18.	Sleme	858	837	A6	ARZ	4	0	0	0	1	0	0	0
19.	Sopač	775	740	A6	ARZ	0	0	0	0	1	0	0	0
20.	Lučice	590	581	A6	ARZ	1	0	0	0	2	0	0	0
21.	Vršek	859	865	A6	ARZ	1	0	0	0	2	0	0	0
22.	Javorova Kosa	1.490	1.450	A6	ARZ	2	0	0	0	2	1	0	0
23.	Pod Vugleš	595	590	A6	ARZ	1	1	0	0	0	0	0	0
24.	Čardak	601	601	A6	ARZ	4	0	0	0	6	1	0	0
25.	Rožman Brdo	508	528	A6	ARZ	2	0	0	0	3	1	0	0
26.	Veliki Gložac	1.126	1.130	A6	ARZ	2	0	0	0	2	0	0	0
27.	Škurinje 2	575	575	A7	ARZ	3	0	0	0	2	0	0	0
28.	Trsat	854	839	A7	ARZ	2	0	0	0	3	0	0	0
29.	Burlica	728	718	A7	ARZ	0	0	0	0	0	0	0	0
30.	Učka	5.062	-	A8	Bina-I	0	0	0	0	1	0	2	0
31.	Mravinci	563	563	D1	HC	0	0	0	0	1	0	0	0
32.	Pećine	1.345	-	D404	HC	0	0	0	0	1	0	0	0
33.	Mali Prolog	545	498	A1	HAC	0	0	0	0	0	0	0	0
34.	Kobiljača	780	832	A1	HAC	0	0	0	0	0	0	0	0
		45.523	36.796			52	4	1	0	52	7	3	0



EuroTap testing		
Tunnel	Year.	Result
Učka	2004	--
Plasina	2005	++
Javorova Kosa	2005	0
Mala Kapela	2006	+
Grič	2006	++
Brinje	2007	++
Veliki Gložac	2008	++
Tuhobić	2009	++
Sv. Rok	2010	++

2. Road tunnels network – tunnel safety



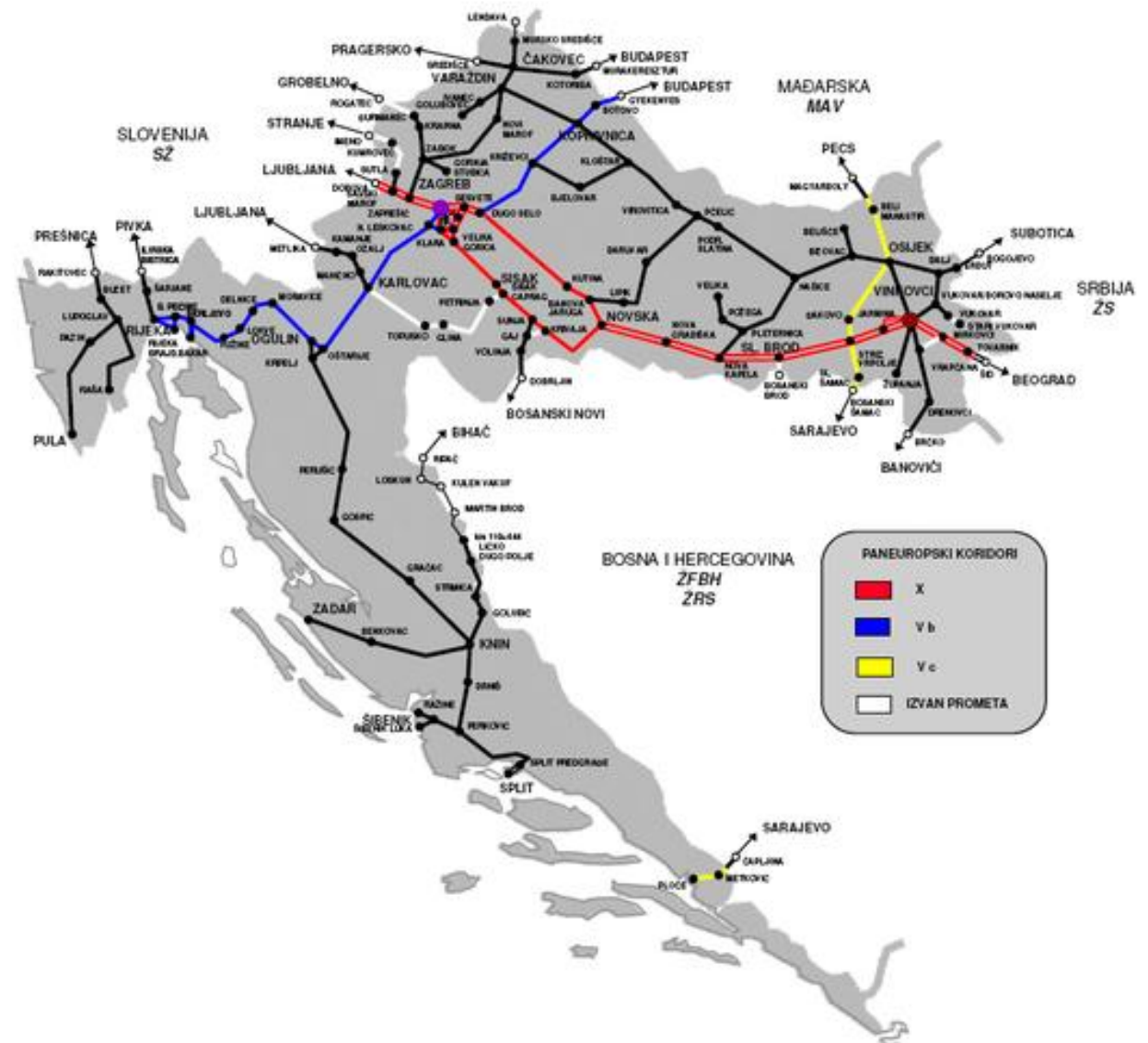
ACTION MEASURE	IMPLEMENTATION				RESPONSIBLE FOR IMPLEMENTATION
	IMPLEMENTED	IN PROGRESS	PRIORITY	LONG-TERM	
Strict sanctioning of drivers who do not obey traffic rules for driving in tunnels	X	X	X	X	Ministry of the Interior
EuroTAP - tunnel assessment	X		X	X	Croatian Autoclub, motorway concession companies, Croatian Roads Ltd.
Installing vertical and horizontal signalization, lighting, video monitoring systems in tunnels				X	ministry in charge of transport, motorway concession companies, Croatian Roads Ltd., County Road Offices
Implementing preventive and educational campaigns			X	X	Ministry of the Interior, ministry in charge of transport, motorway concession companies, Croatian Roads Ltd., Croatian Autoclub, the media

2. Road tunnels network – tunnel safety



Railway network:

- 3 Pan-european corridors
- Total length: 2.605 km
- Single track: 2.351 km
- Double track: 254 km
- 980 km of electrified railway lines (mostly on X. and V.b corridors)



3. Railway tunnels network

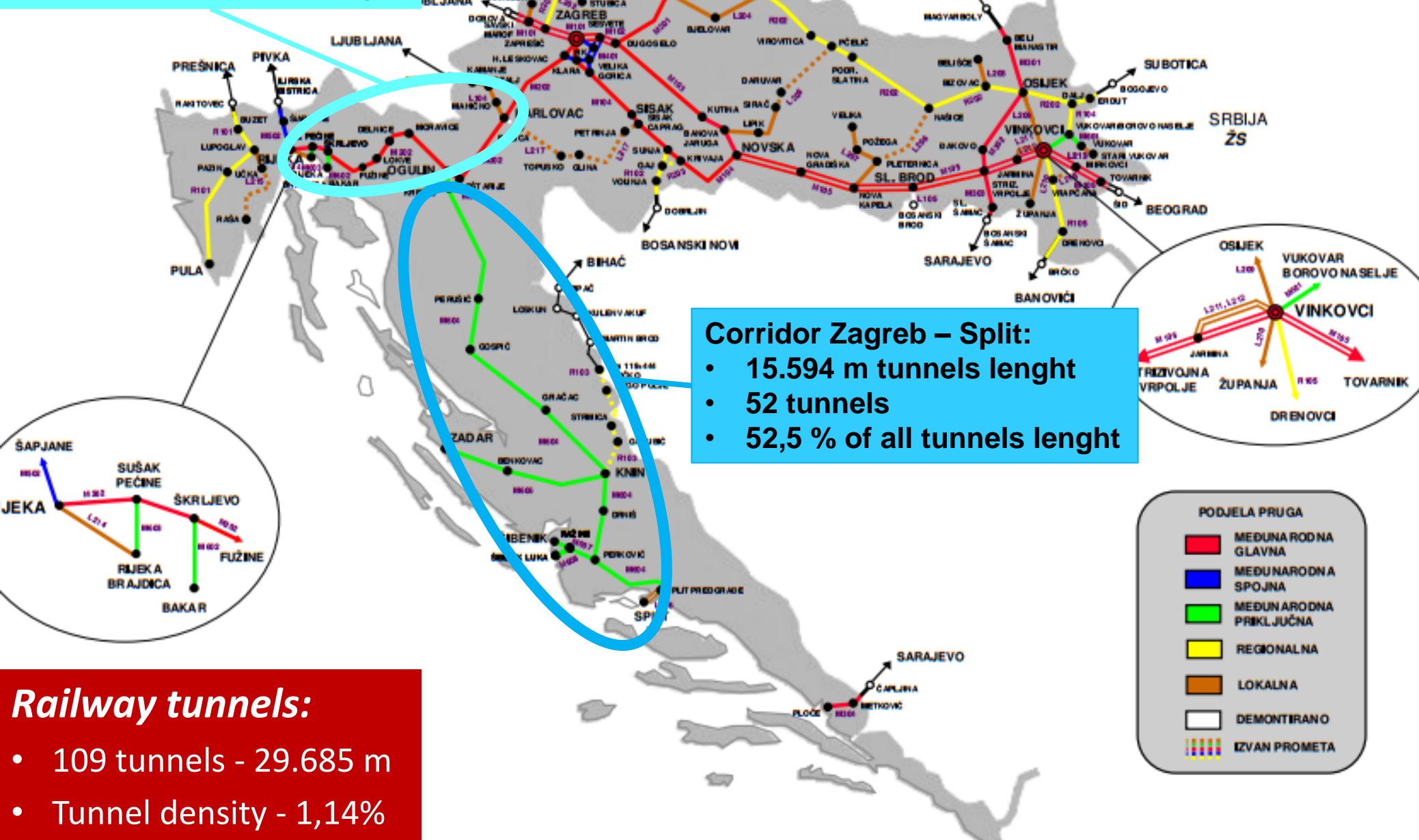


Line	ID	Num of tunnels	Tunnels (m)	Line (m)	Density
S. Marof – Kumrovec – DG	L102	1	174	38.522	0,45%
Karlovac – Kamanje – DG	L103	3	461	28.799	1,60%
Križevci – Bjelovar – Kloštar	L203	1	361	62.047	0,58%
Lupoglav – Raša	L213	4	1.579	52.996	2,98%
Zagreb Gk – Rijeka	M202	17	4.461	227.880	1,96%
Rijeka – Šapjane – DG	M203	2	940	30.896	3,04%
DG – Metković – Ploče	M304	3	382	2.274	16,78%
Zagreb Gk – Sisak – Novska	M502	1	207	116.762	0,18%
Škrljevo – Bakar	M602	2	210	12.586	1,67%
Sušak – Rijeka Brajdica	M603	1	1.838	3.802	48,34%
Oštarije – Knin – Split	M604	29	9.349	322.083	2,90%
Knin – Zadar	M606	22	4.407	95.394	4,62%
DG – Buzet – Pula	R101	1	399	9.114	4,38%
Sunja – Volinja – DG	R102	2	160	21.575	0,74%
DG – L. D. Polje – Knin	R103	18	4.107	59.068	6,95%
Zabok – Đurmanec – DG	R106	2	650	27.188	2,39%
		109	29.684	1.110.986	

3. Railway tunnels network

Corridor Zagreb – Rijeka:

- 7.448 m tunnels length
- 22 tunnels
- 25 % of all tunnels length



Railway tunnels:

- 109 tunnels - 29.685 m
- Tunnel density - 1,14%



Railway tunnels safety:

- Only tunnel Split is in categorized according fire risk regulation,
- Railway tunnels are accident free for last 20 years,
- 5 tunnels are between 1000 – 3000 m length and 6 tunnels are between 500 – 1000 m length.

3. Railway tunnels network – tunnel safety



Transport infrastructure planning:

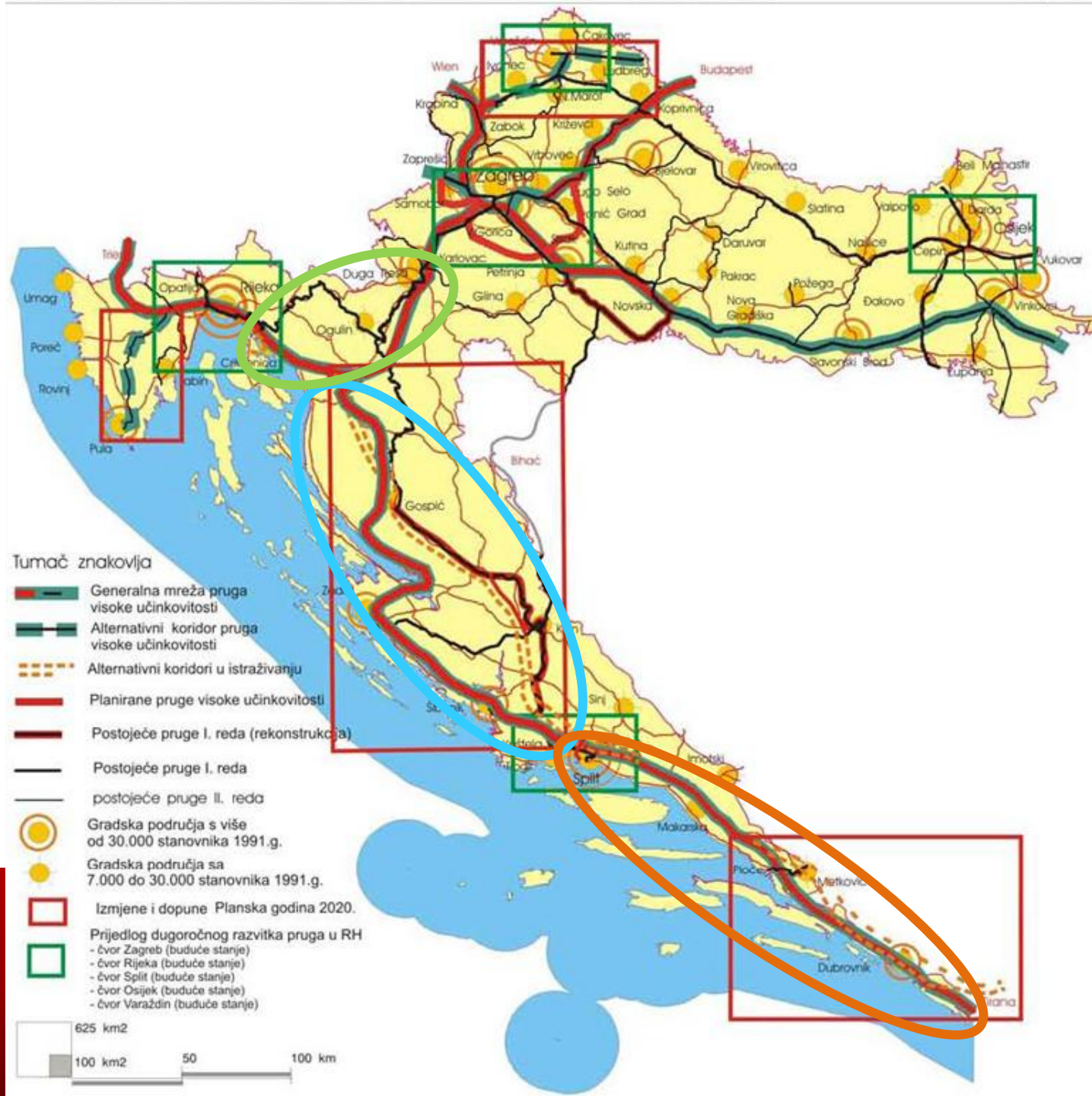
- Physical planning act (NN 153/13)
- Road act (NN 84/11, 22/13, 54/13, 148/13, 92/14)
- Spatial Planning Strategy of the Republic of Croatia (1997, 2013)
- Spatial Planning Program of the Republic of Croatia (1999, 2013) – Preparation of new Strategy started
- Transport Development Strategy of Croatia 2014-2020 (NN 131/14) – Preparation of Strategy renewal started according to new traffic model
- Construction and Maintenance of Public Roads Plan 2013. - 2016. (NN 1/14, 151/14)
- National program of railway infrastructure 2008. - 2012. (NN 31/08) - new 4 year program will be accepted this year

4. Transport infrastructure planning



Spatial planning strategy (railways):

- Speed line: Karlovac - Rijeka
- Plan of Speed line: Oštarije – Split
- Plan of Speed line: Split – Metković – Dubrovnik



New tunnels expected



Spatial planning strategy (roads):

- Completion of highway Rijeka – Žuta lokva
- Completion of highway Zagreb – Macelj (Slovenia)
- Completion of speed road Metković – Dubrovnik – Montenegro border



New tunnels expected



Conclusion:

- Geographic and geo-traffic position of Croatia (impose the need for a large number of tunnels and connecting continental and south parts of Croatia)
- Road tunnels are in good condition (according to relatively new highway network)
- Railway tunnels network reconstruction (is expected due to aging, new routes design and safety reasons in longer tunnels)
- Development of Road and Railway infrastructure will be defined through key strategic documents

5. Conclusion

ITAWTC 2015

LACROMA VALAMAR CONGRESS CENTER
DUBROVNIK, CROATIA



Thank you for your attention!

CONTACT:

Ministry of Maritime Affairs,
Transport and Infrastructure
Prisavlje 14,
10 000 Zagreb, Croatia

Dražen Antolović, Head of sector
Email: drazen.antolovic@mppi.hr
Tel.: +385 1 61 69 408