

“Preparation of necessary documentation for river raising and dredging works on critical sectors on the Danube River in Serbia”

Environmental Impact Assessment Study

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Project manager, Directorate for Inland Waterways



Project funded by
the European Union

Public hearing
Belgrade, 03-10-2013

Sadržaj

Basic data and project range

Strategic and legal framework

Prefeasibility and feasibility opinions and conditions

Definition of critical sector and current navigation conditions

Basic design approach

Current status of environment

Alternative options and residual effects

Mitigation measures

Multi-criteria analysis

Analysis of cumulative hydro-morphological effects

Monitoring programme

Transparency in planning process and public participation

Recap of planning process



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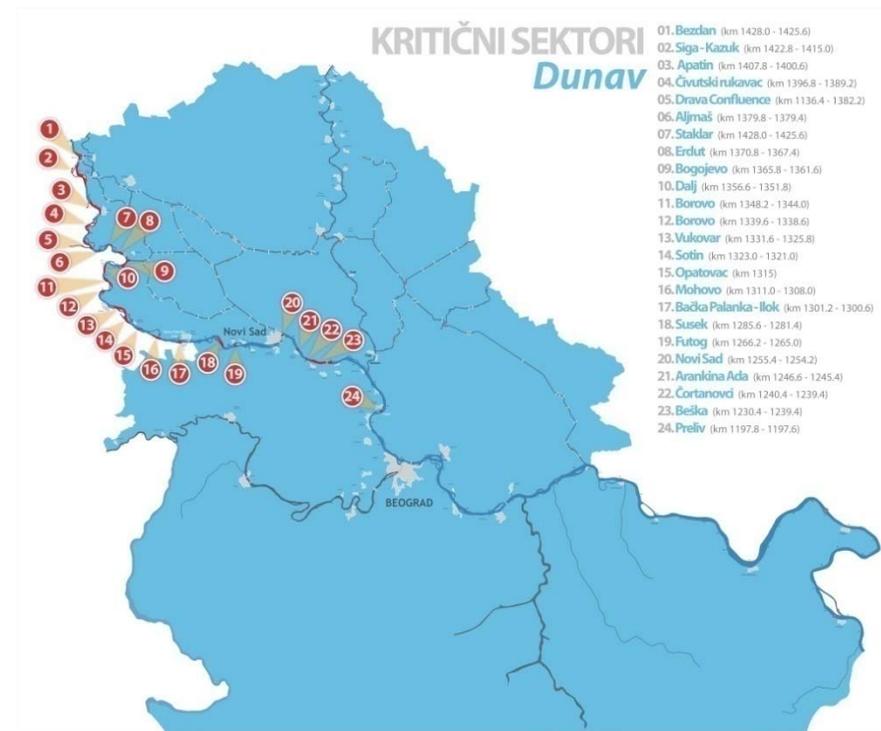
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Basic project data

- EU programme: IPA 2010
- EU funding rate: 100%
- Value: EUR 2.1 Mill
- Timeframe: 2011-2013
- Beneficiaries:
 - Ministry of Transport
 - Directorate for Inland Waterways
- Objective: establishment of minimum **fairway dimensions for safe navigation during low water periods**
- Measure: **combination of structural and nonstructural measures**



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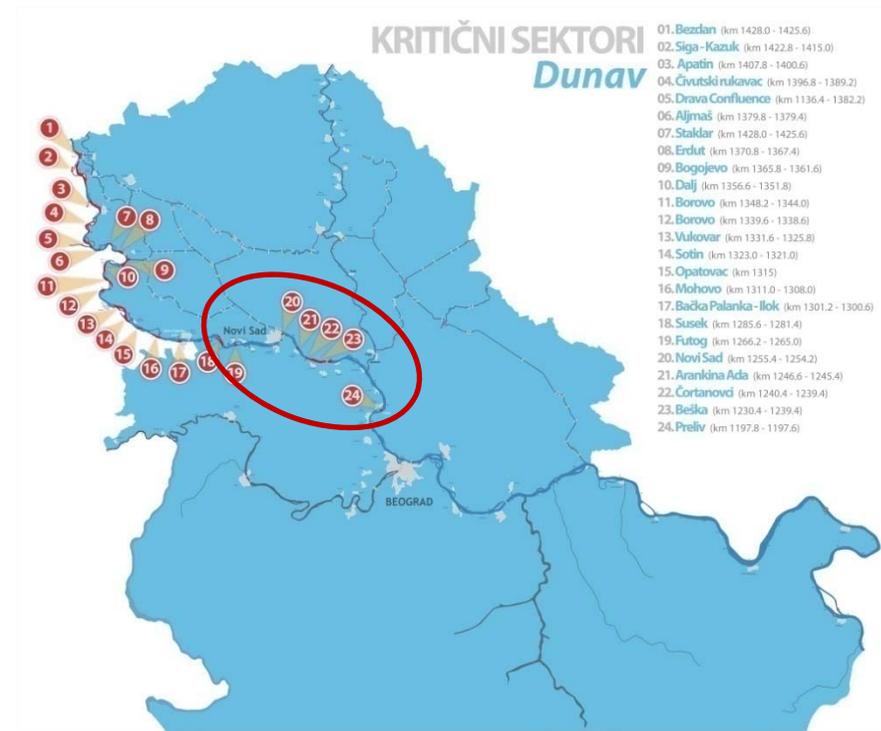
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Project range

- 1D hydraulic model
- Definition of critical sector
- 2D hydrodynamic model
- 2D morphological model
- Feasibility study and conceptual designs
- Multi-criteria analysis
- EIA study
- Main designs and tender documentation for **6 critical sectors**

- Documentation is being prepared in line with the Serbian legislation, as well as with the **EU regulation**



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Strategic and legal framework

Strategic framework:

- Master plan for IWW transport in Serbia(2006)
- Serbian transport development strategy for the period 2008-2015 (2007)
- General transport master plan (2009)
- Spatial plan of the corridor VII (drafted)
- EU strategy for the Danube region (2010)

Inland navigation:

- DC Recommendations
- AGN (UNECE)
- SRB-CRO bilateral agreement on inland navigation and fairway maintenance (2009)
- Law on navigation and ports on inland waterways (2010)
- Bylaws

Water management:

- Law on waters
- Relevant bylaws
- WFD (EU)
- Danube Protection Convention
- Danube River Basin management plan (ICPDR)

Protection of cultural monuments

- Law on cultural heritage
- Bylaws

Environment:

- Law on nature protection
- Law on environment protection
- Law on EIA
- Regulation on ecological network
- Specific spatial plans
- Bylaws

Law on construction and spatial planning



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Prefeasibility and feasibility opinions and conditions

- Republic Hydro Meteorological Institute
- Srbijavode
- Vode Vojvodine
- Beogradvode
- Institute for Cultural Heritage
- Institute for Nature Protection of Vojvodina
- Institute for Nature Protection of Serbia
- Port Master Offices
- Vojvodina Secretariat for Agriculture, Forestry and Water Management
- Directorate for Inland Waterways



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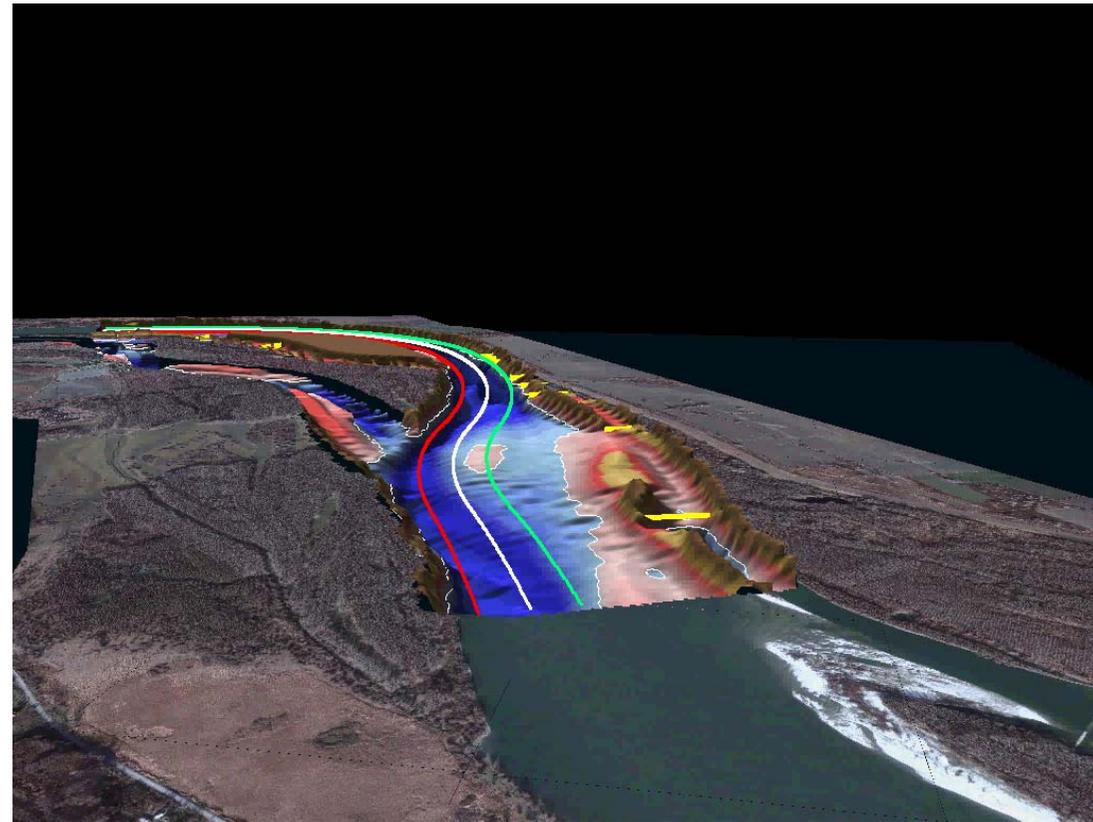
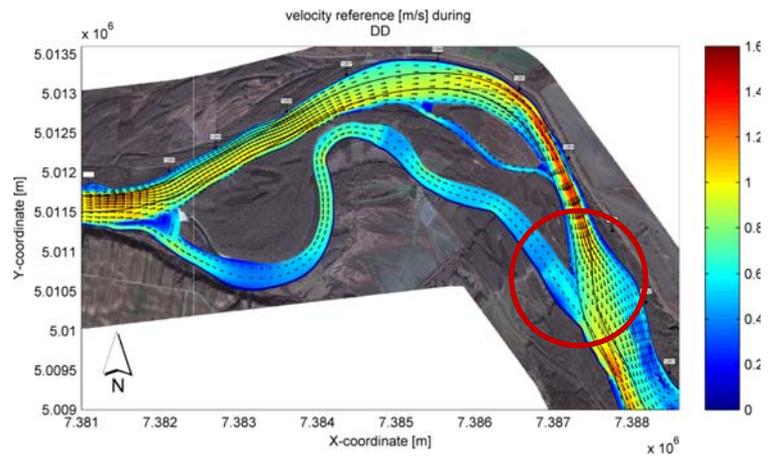
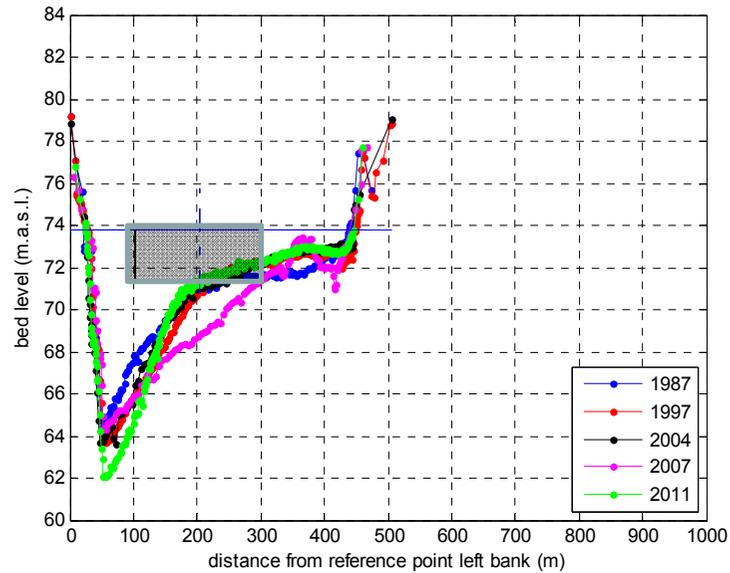
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 DHI

 Plovput  50
YEARS

Definition of critical sector

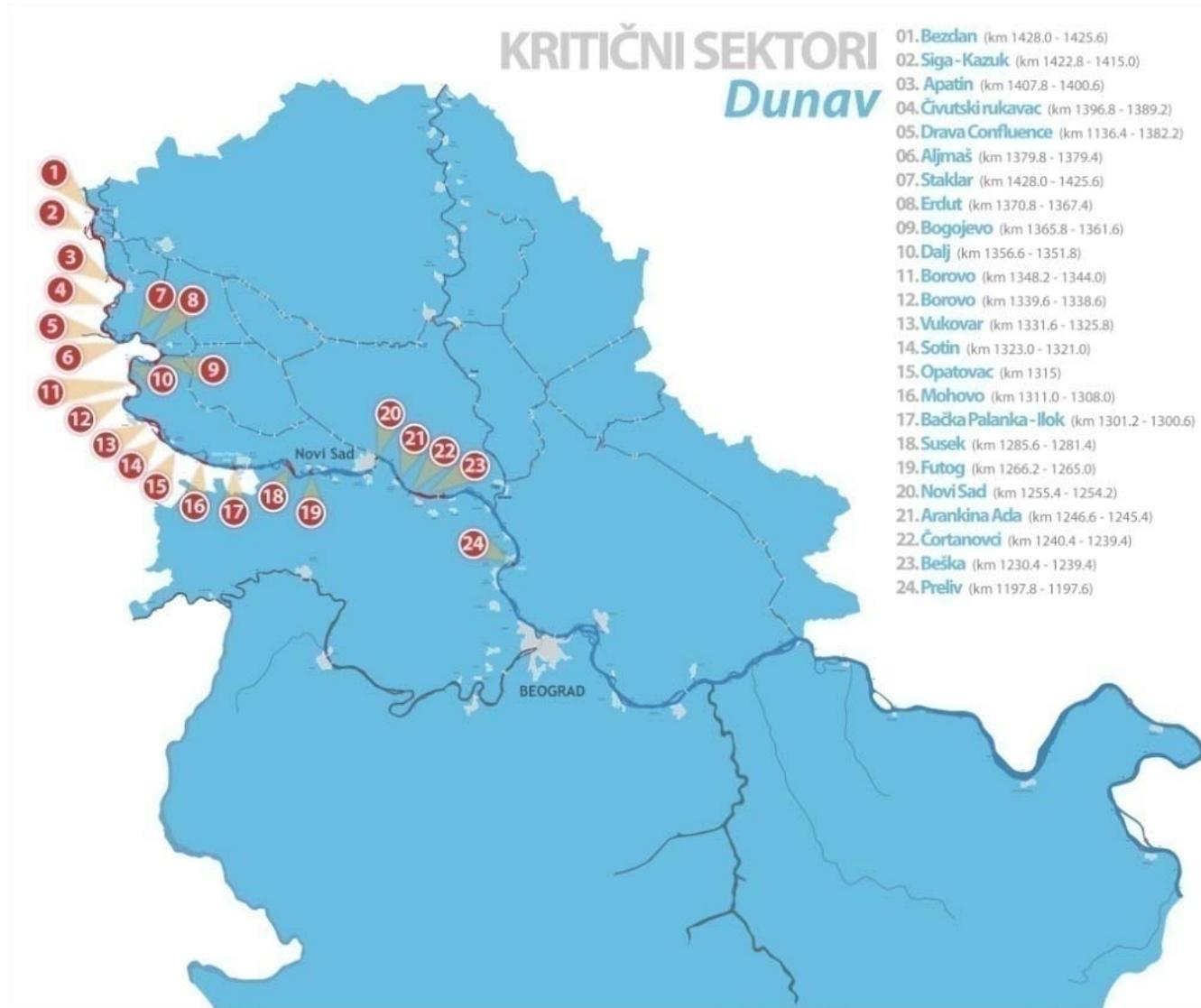


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Current navigation conditions



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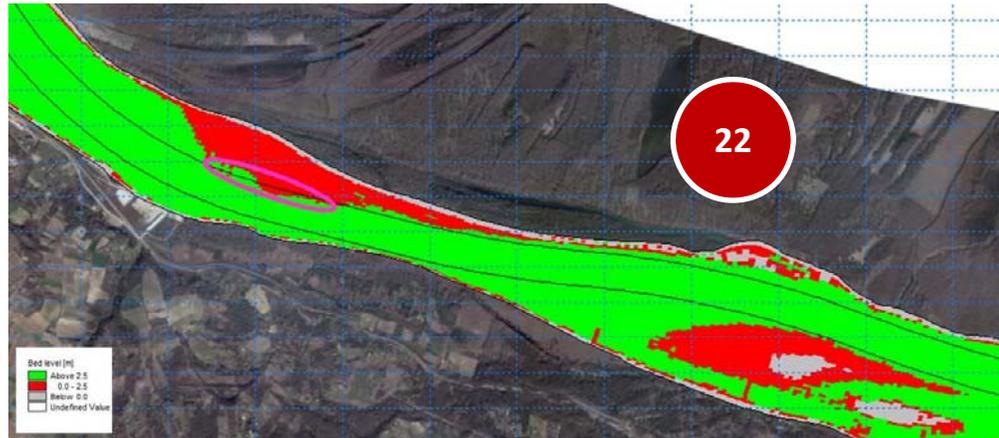
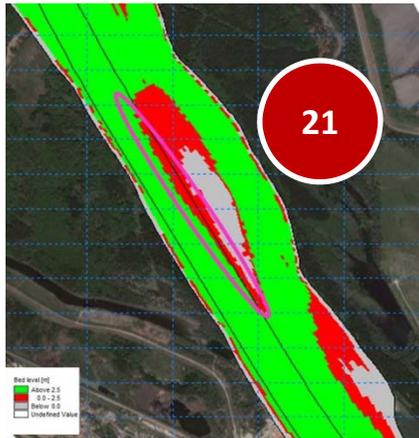
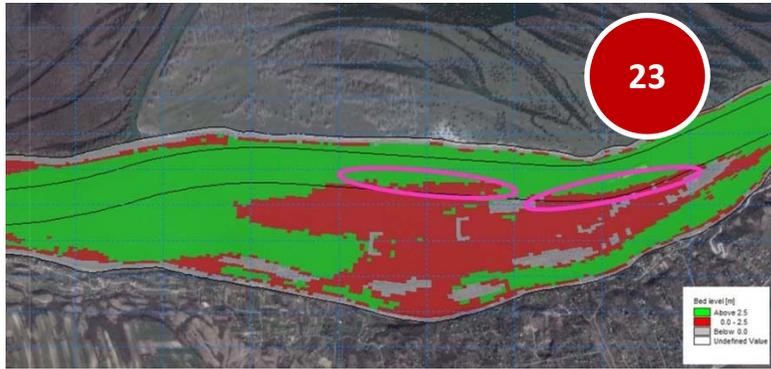
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Current navigation conditions



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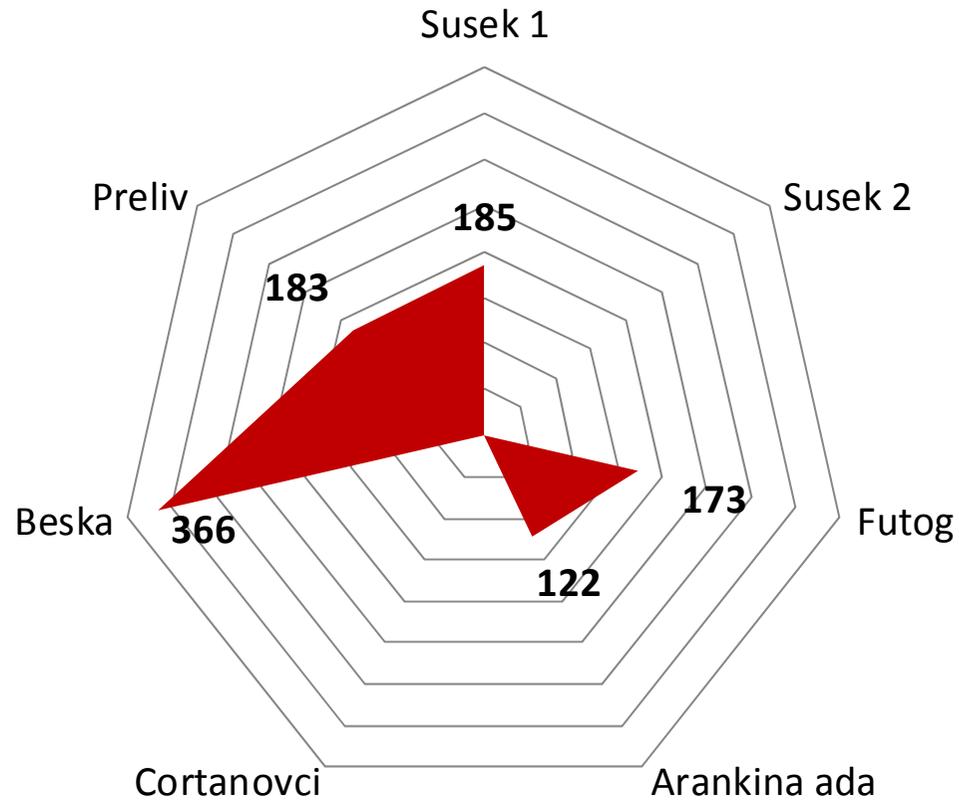
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Current navigation conditions

No of days without 200/180x2.5 in 2012



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Basic design approach

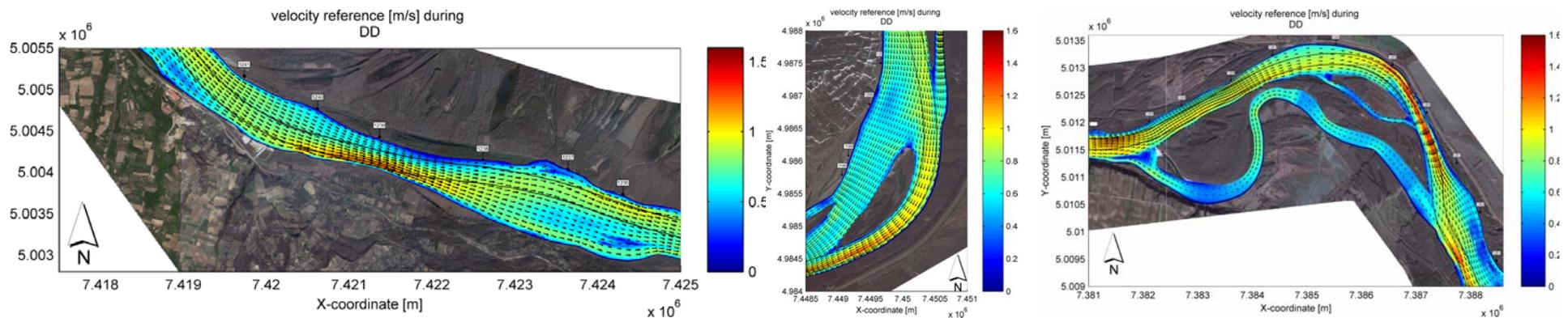
Ensure minimum sustainable fairway depth and width during the low water periods

Preserving
connectivity conditions

Preferring
detached structures

Preserving
sediment equilibrium

Ensuring
mitigation measures



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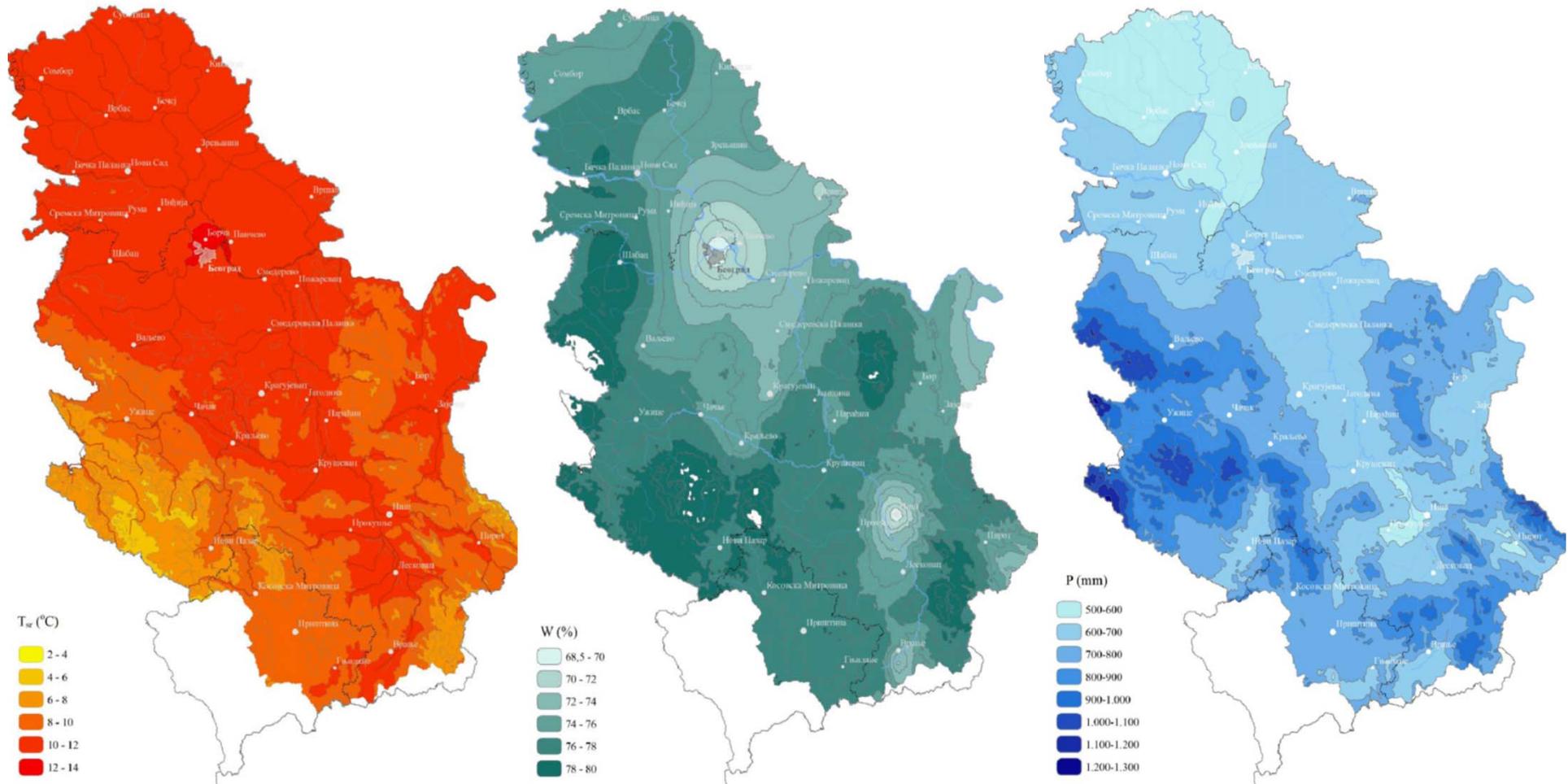
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Pluvput 50 YEARS

Current status of environment

Average temperature, humidity and precipitation (DRBMP, 2011)



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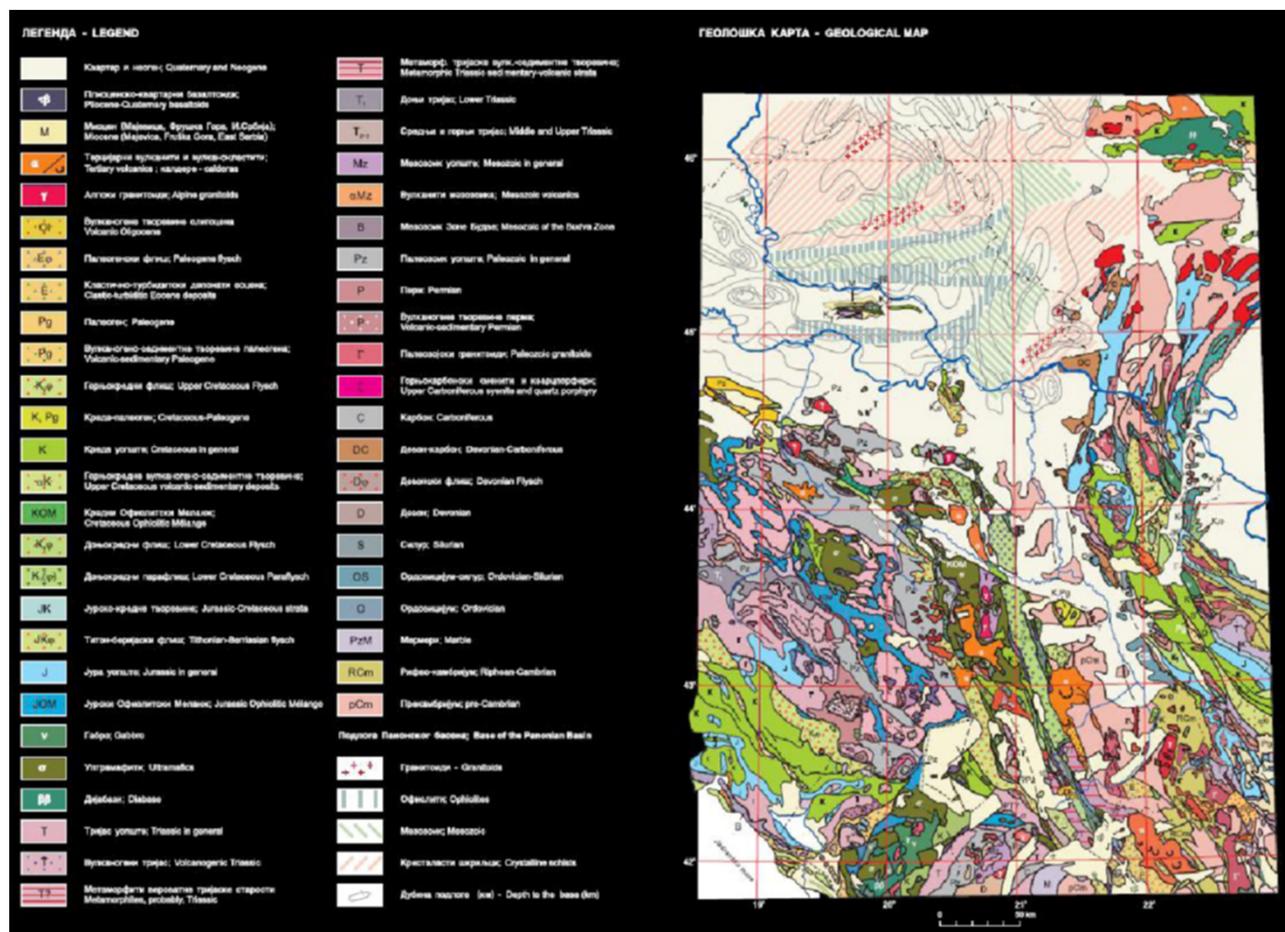
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Current status of environment

Geological map (DRBPM, 2011)



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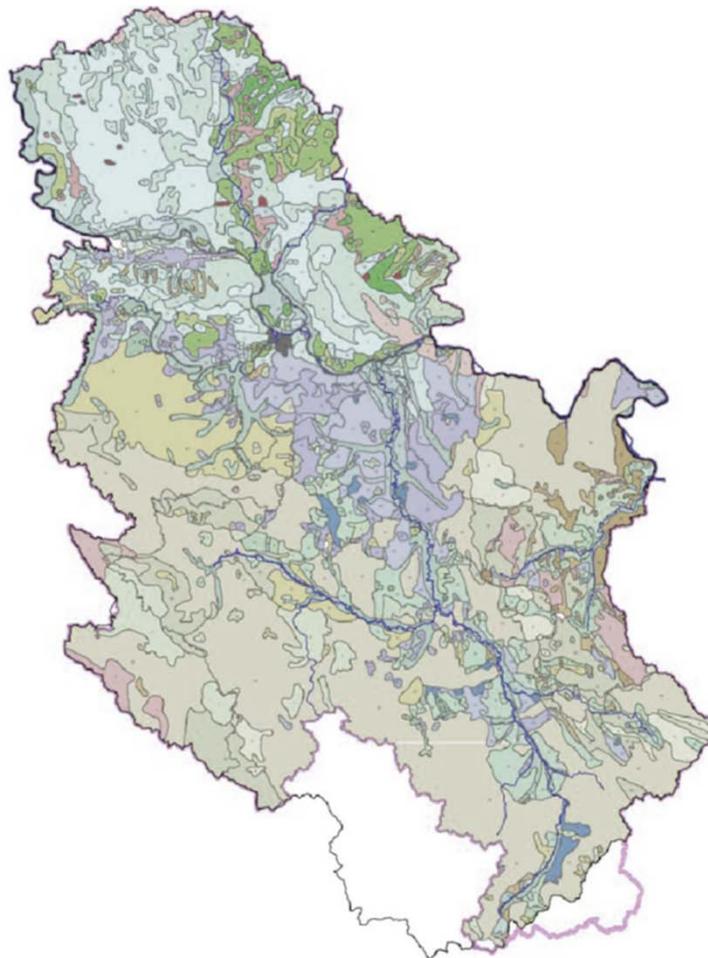
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DHI

Plavput 50 YEARS

Current status of environment

Pedological map (DRBPM, 2011)



- I АУТОМОРФНА ЗЕМЉИШТА**
1° НЕРАЗВИЈЕНА ЗЕМЉИШТА
- 101 КАМЕЉАР - ЛИТОСОЛ (НА РАЗНИМ ПОДЛОГАМА)
 - 102 СИРОЗЕМ - РЕГИСОЛ
 - 103 БОЉСКИ ПЕСАК (АРЕНОСОЛ)
 - 104 АНТРОПОГЕНЕНОВАНИ (РИГОЛОВАНО) ПЕСАК
 - 105 КОЛУВИЈАЛНО (ДЕЛУВИЈАЛНО) ЗЕМЉИШТЕ
- 2° ХУМУСНО АКУМУЛАТИВНА ЗЕМЉИШТА**
- 201 РЕДИЊНА
 - 202 РАКЕР (ХУМУСНО - СЈЕВИКАТНО ЗЕМЉИШТЕ)
 - 203 СМОУНЦА (ВЕРТИСОЛ)
 - 204 СМОУНЦА ЕРОДИРАНА
 - 205 СМОУНЦА (ВЕРТИСОЛ) ОГАЉАЧЕНА, ЛЕСНИВРАНА
 - 206 ЧЕРНОЗЕМ КАРБОНАТНИ
 - 207 ЧЕРНОЗЕМ ИСЛУЖБЕНИ ОГАЉАЧЕН
 - 208 ЧЕРНОЗЕМ ЛИВАДСКИ КАРБОНАТНИ
 - 209 ЧЕРНОЗЕМ БЕСКАРБОНАТНИ
 - 210 ЧЕРНОЗЕМ БАСЛАВЕНИ АЛКАЛИЗОВАНИ
- 3° КАМБИЧНА (СМЕБА) ЗЕМЉИШТА**
- 301 ГАЉАЧА (ЕУТРОФНИ КАМБИСОЛ)
 - 302 ГАЉАЧА ЕРОДИРАНА
 - 303 ГАЉАЧА ЛЕСНИВРАНА
 - 304 ДИСТРИБУИРНИ КАМБИСОЛ (СМЕБЕ ШУМСКО КИСЕЛО НА РАЗНИМ ПОДЛОГАМА - РИГОЛИТИЧНО ЗЕМЉИШТЕ)
 - 305 СМЕБЕ ЗЕМЉИШТЕ НА КРЕЧВАКУ - ШУМСКО (КАЉКО) КАМБИСОЛ
 - 306 ЦРВЕЊИЦА (РЕЛИКТНА И КРИПТОРЕЛИКТНА)
- 4° ЕЛУВИЈАЛНО - ИЛУВИЈАЛНА ЗЕМЉИШТА**
- 401 ЛЕСНИВРАНО (ЕЛИМЕРИЗОВАНО) ЗЕМЉИШТЕ - ЛУВИСОЛ
- II ХИДРОМОРФНА ЗЕМЉИШТА**
1° ЕПИГЛЕЈНА (ПСЕУДОГЛЕЈНА) ЗЕМЉИШТА
- 501 ПСЕУДОГЛЕЈ
- 2° ХИПОГЛЕЈНА - МОЧВАРНО - ГЛЕЈНА ЗЕМЉИШТА**
- 601 МОЧВАРНО ГЛЕЈНО ЗЕМЉИШТЕ (ГУЛЕЈ)
- 3° ФЛУВИЈАТИЛНА И ФЛУВИОГЛЕЈНА ЗЕМЉИШТА**
- 701 А.Ф. ВИЈАЛНО ЗЕМЉИШТЕ (ФЛУВИСОЛ)
 - 702 А.Ф. ВИЈАЛНО ЗЕМЉИШТЕ (ЛИВНОВИТО ЗАКАРЕНО ОГАЉАЧЕНО БАСЛАВЕНО)
 - 703 А.Ф. ВИЈАЛНО - ДЕЛУВИЈАЛНО ЗЕМЉИШТЕ
 - 704 ФЛУВИЈАЛНО ЛИВАДСКО ЗЕМЉИШТЕ (ХУМОФОЛУВИСОЛ)
 - 705 РИТСКА ПРИВЦА - ФЛУВИ ГЛЕЈ КАРБОНАТНИ (ХУМО ГЛЕЈ)
 - 706 РИТСКА ПРИВЦА - ФЛУВИ ГЛЕЈ БЕСКАРБОНАТНИ
 - 707 РИТСКА ПРИВЦА - ФЛУВИ ГЛЕЈ БАСЛАВЕНИ АЛКАЛИЗОВАНИ
 - 708 СУБАКВАЛНО (ПОДРОДНО) ЗЕМЉИШТЕ
- III ХАЛОМОРФНА ЗЕМЉИШТА**
- 801 СОЛОНЧАК
 - 802 СОЛОНЕЦ
 - 803 СОЛОН



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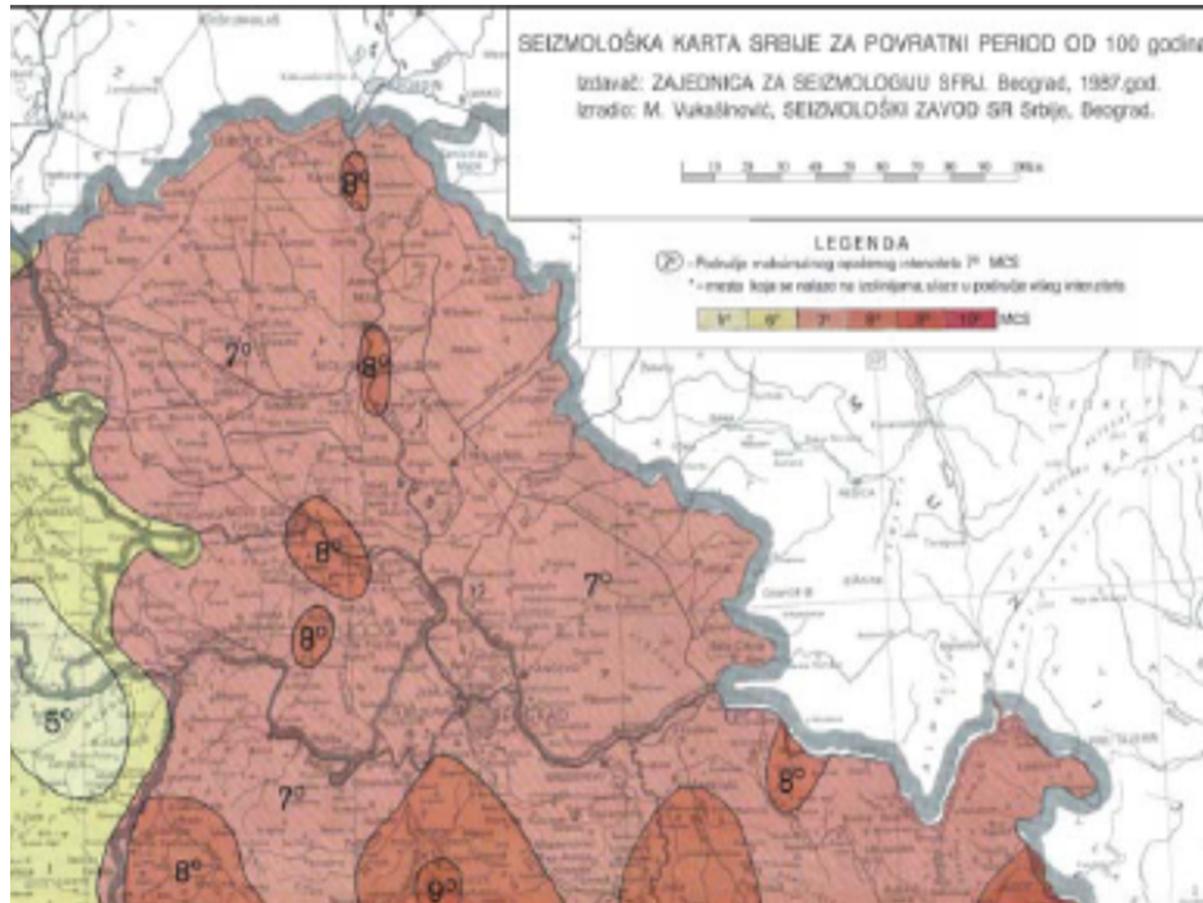
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Current status of environment

Seismological map (SZS)



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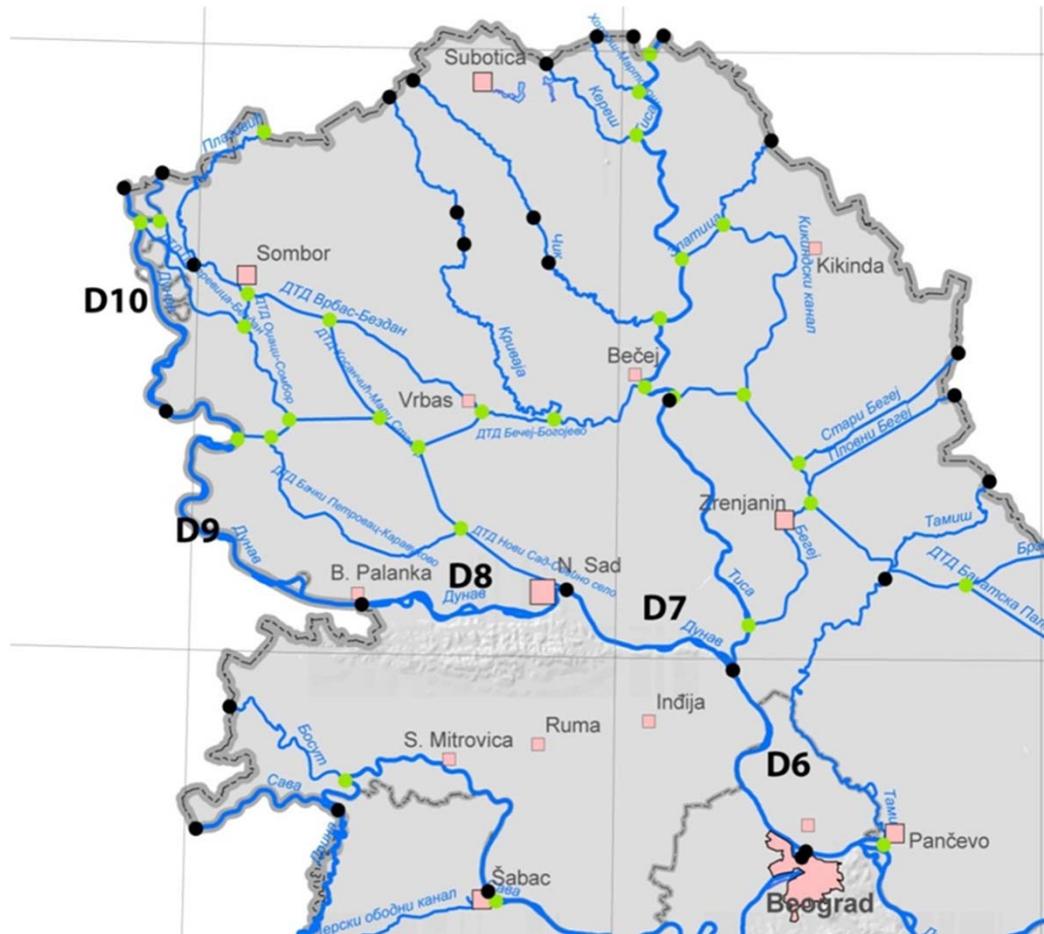
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Current status of environment

Types of water bodies (IBISS, 2012)



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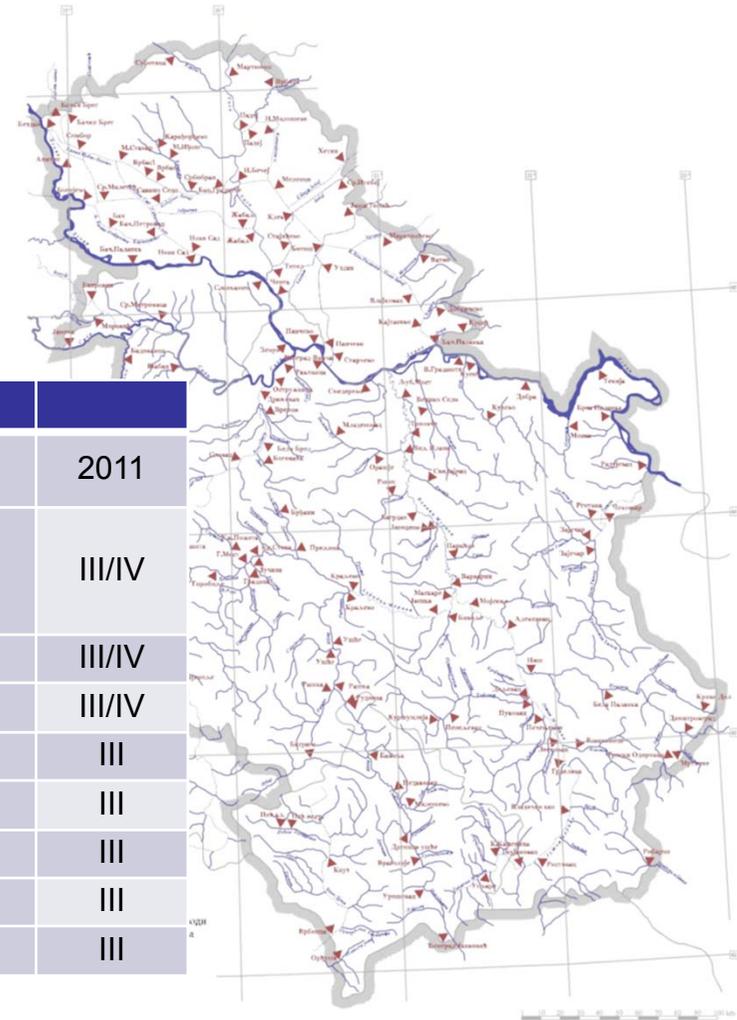
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Current status of environment

Water quality monitoring (RHMZ, SEPA)



Контролне станице на Дунаву	Забележене класе квалитета воде					
	2006	2007	2008	2009	2010	2011
Бездан, гранично подручје	IV	IV	III	III	III/IV	III/IV
Апатин	III/IV	III/IV	/	III	III	III/IV
Богојево	IV	IV	III	III	III	III/IV
Бачка Паланка	III/IV	III/IV	III	III	III/IV	III
Нови Сад	III/IV	III	III	II/III	III/IV	III
Сланкамен	-	III	-	-	-	III
Чента	-	III/IV	-	-	-	III
Земун	III/IV	III/IV	III	III	III	III



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Current status of environment

Water quality monitoring (IHTM, 2007)

	NAUČNA USTANOVA INSTITUT ZA HEMIJU, TEHNOLOGIJU I METALURGIJU UNIVERZITET U BEOGRADU SEKTOR ZA EKOLOGIJU I TEHNOEKONOMIKU ANALITIČKO-EKOLOŠKA LABORATORIJA Njegoševa 12, 11001 Beograd, P. Fax: 473 Telefak: 3376225, 3370153, 3370501	
	IZVEŠTAJ O ISPITIVANJU VODA	
Broj: 384/55V-399/70V Datum: 06.09.2011.		

	NAUČNA USTANOVA INSTITUT ZA HEMIJU, TEHNOLOGIJU I METALURGIJU UNIVERZITET U BEOGRADU SEKTOR ZA EKOLOGIJU I TEHNOEKONOMIKU ANALITIČKO-EKOLOŠKA LABORATORIJA Njegoševa 12, 11001 Beograd, P. Fax: 473 Telefak: 3376225, 3370153, 3370501	
	IZVEŠTAJ O ISPITIVANJU VODA	
Broj: 384/55V-399/70V Datum: 06.09.2011.		

ANALITIČKO-EKOLOŠKA LABORATORIJA
Laboratorija za ispitivanje voda

REZULTATI SENZORSKIH, FIZIČKIH I FIZIČKO-HEMIJSKIH ISPITIVANJA

Naziv uzorka: Dunav - D2, Dunav - D4, Dunav - D12
 Identifikaciona oznaka: 385/56V, 387/58V, 386/56V
 Datum završetka analize: 06.09.2011.
 Opšti podaci o uzorku: sedimenti prikupljeni u projektu „Preparation of Documentation for River Training Works on Selected Locations along the Danube River“
 Zakonska regulativa:

Red. br.	Ispitivani parametar	Jed. mere	Dunav-D2 (385/56V) ¹	Dunav-D4 (387/58V) ¹	Dunav-D12 (386/56V) ¹	Oznaka metode
1.	% suve materije	%	81.0	76.9	67.1	Priručnik P-IV-7
2.	% gubitka šarenjem	%	2.1	3.6	1.8	APHA - Method 2540E*
3.	Određivanje hemijske potrošnje kisika	mg/kg	<81.3	84.1	100.2	SRPS ISO 9099:1994
4.	Određivanje sadržaja amonijaka	mg/Nkg	1.06	6.95	3.76	Priručnik P-V-2/3
5.	Azot po Kjeldalu	mg/Nkg	1.23	7.29	4.00	Priručnik P-V-6/A*
6.	Ukupan azot	mg/Nkg	3.45	10.8	42.3	*
7.	Organski azot	mg/Nkg	0.17	0.36	0.24	*
8.	Određivanje sadržaja fosfata	mg/Pkg	0.30	6.07	0.62	Priručnik P-V-19/A
9.	Određivanje sadržaja natrijuma	mg/kg	155.6	161.6	175.4	APHA-Method 3111-B
10.	Određivanje sadržaja kalijuma	mg/kg	32.4	32.7	46.8	APHA-Method 3111-B
11.	Određivanje sadržaja gvožđa	mg/kg	16.8	42.0	228.0	APHA-Method 3111-B
12.	Određivanje sadržaja mangana	mg/kg	9.08	21.2	70.2	APHA-Method 3111-B
13.	Određivanje sadržaja bakra	mg/kg	<0.091	<0.062	<0.060	APHA-Method 3111-B
14.	Određivanje sadržaja cinka	mg/kg	<0.020	<0.021	0.076	APHA-Method 3111-B
15.	Određivanje sadržaja olova	mg/kg	<0.491	<0.497	<0.480	APHA-Method 3111-B
16.	Određivanje sadržaja hroma	mg/kg	<0.245	<0.248	<0.240	EPA-Method 201.1-1972
17.	Određivanje sadržaja nikla	mg/kg	<0.123	<0.124	<0.120	APHA-Method 3111-B

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Naziv uzorka: Dunav - D7, Dunav - D10
 Identifikaciona oznaka: 390/51V, 393/64V
 Datum završetka analize: 06.09.2011.
 Opšti podaci o uzorku: sedimenti prikupljeni u projektu „Preparation of Documentation for River Training Works on Selected Locations along the Danube River“
 Zakonska regulativa:

Red. br.	Ispitivani parametar	Jed. mere	Dunav-D7 (390/51V)	Dunav-D10 (393/64V)	Oznaka metode
1.	% suve materije	%	50.9	47.5	Priručnik P-IV-7
2.	% gubitka šarenjem	%	3.2	2.6	APHA - Method 2540E*
3.	Određivanje sadržaja natrijuma	mg/L	32.6	17.2	APHA-Method 3111-B
4.	Određivanje sadržaja kalijuma	mg/L	5.31	3.03	APHA-Method 3111-B
5.	Određivanje sadržaja gvožđa	mg/L	0.16	1.30	APHA-Method 3111-B
6.	Određivanje sadržaja mangana	mg/L	0.13	2.7	APHA-Method 3111-B
7.	Određivanje sadržaja bakra	mg/L	<0.030	<0.030	APHA-Method 3111-B
8.	Određivanje sadržaja cinka	mg/L	0.051	0.022	APHA-Method 3111-B
9.	Određivanje sadržaja olova	mg/L	<0.24	<0.24	APHA-Method 3111-B
10.	Određivanje sadržaja hroma	mg/L	<0.12	<0.12	EPA-Method 201.1-1972
11.	Određivanje sadržaja nikla	mg/L	<0.06	<0.06	APHA-Method 3111-B
12.	Određivanje sadržaja arsena	mg/L	0.004	0.023	SRPS ISO 11969:2002
13.	Određivanje sadržaja žive	mg/L	<0.0005	<0.0005	BS EN 1483:2007
14.	Ukupan ugljovodonični	mg/kg	<1.0	<1.0	EN 14043**
15.	Granulometrijska analiza	-	Izveštaj br.1774 od 22.03.2011. ²		

Napomena:
 *Oznaka * odnosi se na neakreditovanu metodu.
 **Izveštaj granulometrijske analize se nalazi u prilogu
 †Parametri su rađeni iz pomoćne vode

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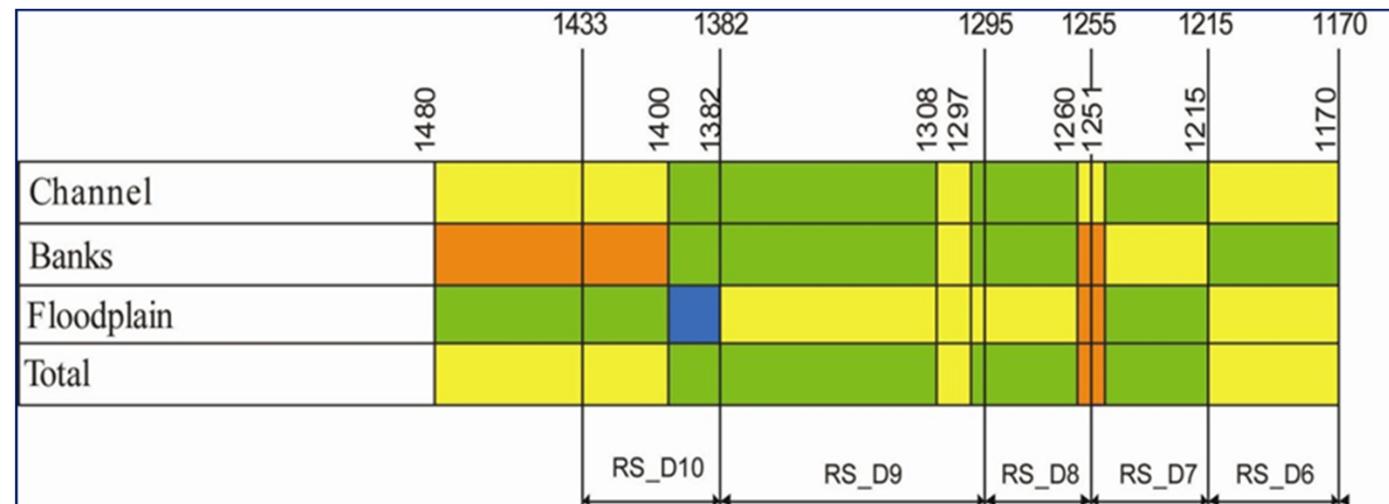
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Current status of environment

Hydro-morphological status (JDR, 2008)

ркм	Дужина (km)	Главни ток	Обале	Плавна подручја	Укупно	Опис
1480-1400	80	3	4	2	3	Умерено измењен
1400-1382	18	2	2	1	2	Благо измењен
1382-1308	74	2	2	3	2	Благо измењен
1308-1297	11	3	3	3	3	Умерено измењен
1297-1260	37	2	2	3	2	Благо измењен
1260-1251	9	3	4	4	4	Веома измењен
1251-1215	36	2	3	2	2	Благо измењен
1215-1170	45	3	2	3	3	Умерено измењен



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Current status of environment

Ecological and chemical status of water bodies (IBISS, 2012)

Водно тело	Статус изменености	Циљна класа	Бентосни макро бескичмењаџи	Фитобентосне и акватичне макрофите	Укупан биолошки статус	Ниво поузданости за биолошки статус	Параметри који подржавају BQE	Посебни загађивачи	Ниво поузданости за посебне загађиваче	Укупан еколошки статус	Ниво поузданости за еколошки статус	Хемијски статус	Ниво поузданости за хемијски статус	Укупни статус
Д6	HMWB ¹⁾	3	3	3	3	М	2	2	М	3	М	3	М	3
Д7	HMWB	3	3	3	3	М	2	2	М	3	М	3	М	3
Д8	HMWB кандидат ²⁾	3	2	2	2	М	2	2	М	2	М	3	М	3
Д9	HMWB кандидат	3	2	2	2	М	2	2	М	2	М	3	М	3
Д10	HMWB кандидат	3	2	2	2	М	2	2	М	2	М	3	М	3



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Current status of environment

Particle size distribution analysis (Faculty of Mining and Geology, 2011)

ovor sika u mm	M%	K%	frakcije
0.500	0.00	100.00	8
0.250	8.98	91.02	9
0.125	77.80	13.22	10
0.063	11.73	1.49	11
0.001	1.49	0.00	12

PRILOG - 9

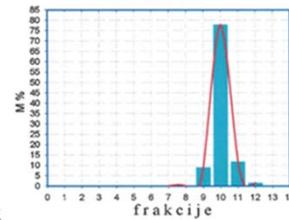
Uzorak D9

Pesak	Alevrit	Glina
99.02	0.98	0.00

TROKOMPONENTNI DIJAGRAM



HISTOGRAM



20

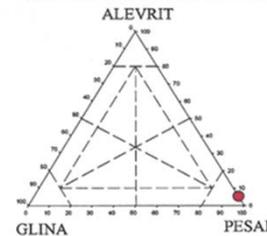
ovor sika u mm	M%	K%	frakcije
0.500	0.47	99.53	8
0.250	21.11	78.42	9
0.125	59.22	19.20	10
0.063	12.21	6.99	11
0.001	6.99	0.00	12

PRILOG - 16

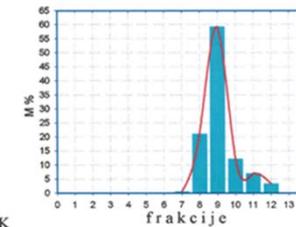
Uzorak D16

Pesak	Alevrit	Glina
94.77	5.23	0.00

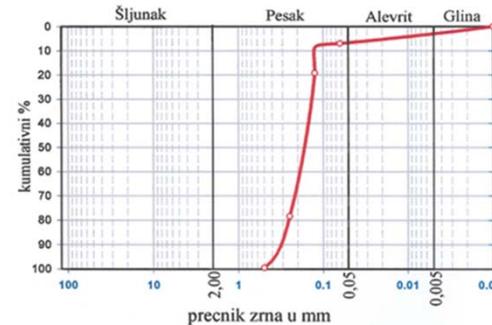
TROKOMPONENTNI DIJAGRAM



HISTOGRAM



GRANULOMETRIJSKA KRIVA



34



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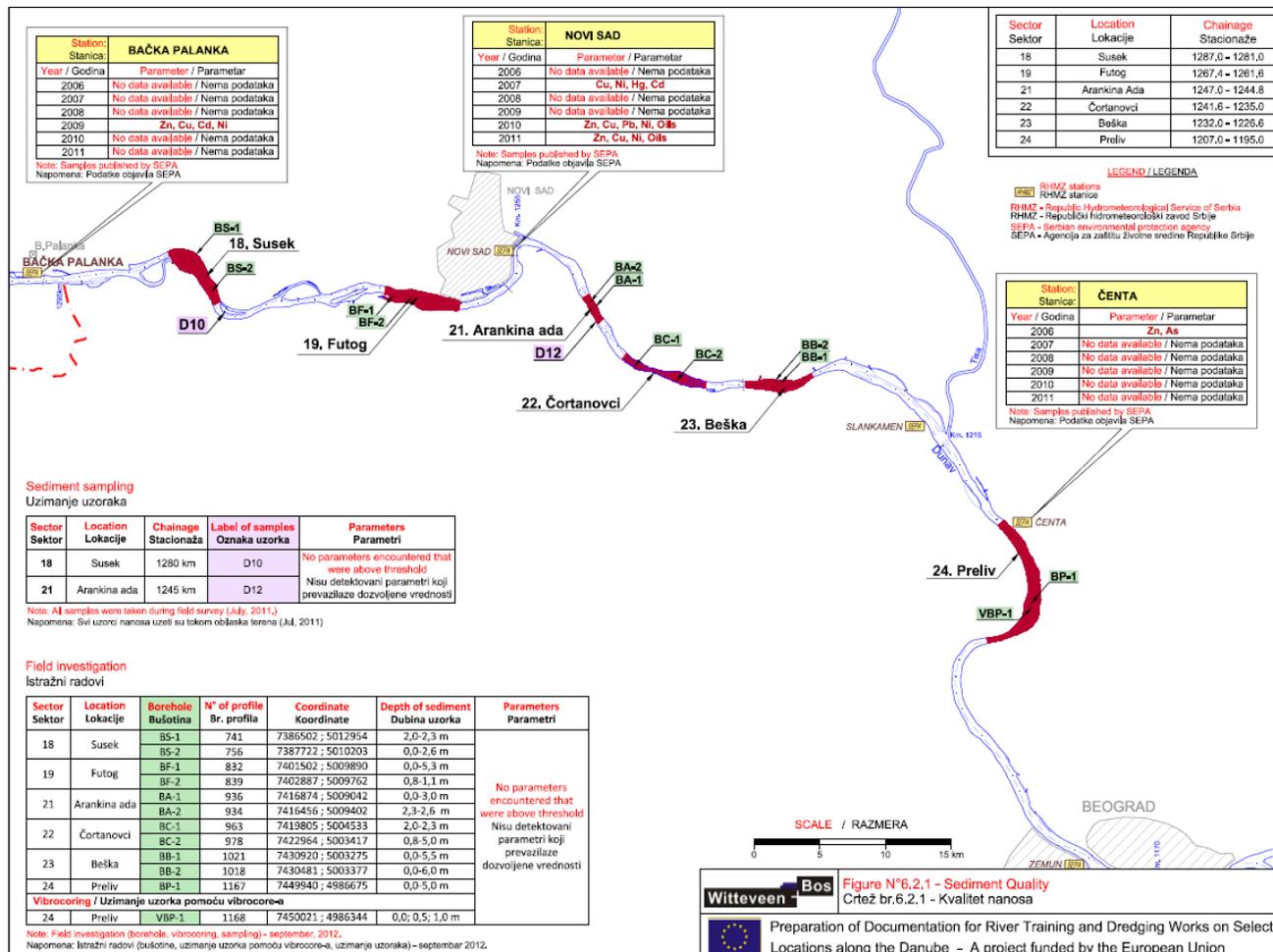
Witteveen + Bos

ENERGOPROJEKT



Current status of environment

Sediment quality (SEPA 2006-2011, HZ DTD 2012)



Project funded by the European Union



Current status of environment

Sediment quality (HZ DTD, 2012)

Лабораторијски број	Локација	Дубина	Сонда
1	Аранкина Ада	0,0-3,0	БА-1
2	Аранкина Ада	2,3-2,6	БА-2
3	Сусек	0,0-2,6	БС-1
4	Сусек	2,0-2,3	БС-2
5	Прелив	0,0-5,0	БП-1
6	Прелив	1,0	ВБП-1
7	Чортановци	2,0-2,3	БЦ-1
8	Чортановци	0,8-5,0	БЦ-2
9	Бешка	0,0-6,0	ББ-2
10	Бешка	0,0-5,5	ББ-1
11	Футог	0,0-5,3	БФ-1
12	Футог	0,8-1,1	БФ-2

Лаб бр.	Cd	Cr	Cu	Ni	Pb	Zn	Hg*	As	Co	Mo
1	<MDL	9,4	3,2	12,5	3,8	30,8	<MDL	3,5	4,4	<MDL
2	<MDL	10,3	2,6	10,7	3,0	38,0	<MDL	2,0	4,0	<MDL
3	<MDL	7,9	2,3	8,3	2,1	23,4	<MDL	2,5	3,3	<MDL
4	<MDL	9,3	8,0	8,9	2,6	25,5	<MDL	2,5	3,5	<MDL
5	<MDL	11,1	2,8	11,9	4,2	40,4	<MDL	3,3	4,7	<MDL
6	<MDL	27,4	14,8	21,0	13,4	117,0	<MDL	4,0	8,5	<MDL
7	<MDL	13,8	3,3	12,4	2,8	41,0	<MDL	1,5	4,5	<MDL
8	<MDL	21,5	6,7	16,5	6,1	43,9	<MDL	2,8	6,0	<MDL
9	<MDL	14,0	4,6	12,1	6,2	42,6	<MDL	3,6	4,9	<MDL
10	<MDL	10,3	3,4	10,8	5,6	38,8	<MDL	2,5	4,2	<MDL
11	<MDL	8,6	2,8	10,7	3,0	33,9	<MDL	2,7	3,8	<MDL
12	<MDL	8,0	2,8	9,8	1,2	17,5	<MDL	1,1	3,9	<MDL

*MDL Метода границе детекције(0.1 mg/kg)



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ENERGOPROJEKT



Current status of environment

Sediment quality (HZ DTD, 2012)

ПАХ (mg/kg)	Лабораторијски број						ПАХ (mg/kg)	Лабораторијски број					
	1	2	3	4	5	6		7	8	9	10	11	12
Нафтален	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.	Нафтален	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.
Аценафилен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.	Аценафтилен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.
Аценафтилен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.	Аценафтилен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.
Флуорен	0,0017	н.д.	н.д.	н.д.	н.д.	0,0095	Флуорен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.
Фенантрен	н.д.	н.д.	0,0057	н.д.	0,0079	н.д.	Фенантрен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.
Антрацен	н.д.	0,006	н.д.	н.д.	н.д.	0,0429	Антрацен	0,0048	н.д.	н.д.	н.д.	н.д.	0,0048
Флуорантен	0,0044	0,0039	0,0068	н.д.	0,0057	0,0627	Флуорантен	н.д.	н.д.	н.д.	0,0037	н.д.	н.д.
Пирен	0,0030	0,006	н.д.	н.д.	н.д.	н.д.	Пирен	0,0021	0,006	н.д.	н.д.	н.д.	0,0021
Бензо(а)антрацен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.	Бензо(а)антрацен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.
Кризен	н.д.	н.д.	0,0095	н.д.	н.д.	0,0337	Кризен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.
Бензо(б)флуорантен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.	Бензо(б)флуорантен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.
Бензо(к)флуорантен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.	Бензо(к)флуорантен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.
Бензо(а)пирен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.	Бензо(а)пирен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.
Индено(1,2,3-цд)пирен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.	Индено(1,2,3-цд)пирен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.
Дибензи(а,х)антрацен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.	Дибензи(а,х)антрацен	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.
Бензо(г,х,и)пирелен	н.д.	н.д.	0,0047	н.д.	н.д.	н.д.	Бензо(г,х,и)пирелен	н.д.	н.д.	0,0047	н.д.	н.д.	н.д.
Напомена: н.д. – није детектован							Напомена: н.д. – није детектован						



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ENERGOPROJEKT



Current status of environment

Sediment quality (HZ DTD, 2012)

Лаб. бр.	PCB 28 LOD 0.0005 mg/kg	PCB 52 LOD 0.0005 mg/kg	PCB 101 LOD 0.0005 mg/kg	PCB 138 LOD 0.0005 mg/kg	PCB 153 LOD 0.0005 mg/kg	PCB 180 LOD 0.0005 mg/kg
1	0,004	0,010	<LOD	<LOD	<LOD	<LOD
2	н.д.	0,042	<LOD	<LOD	н.д.	0,0003
3	0,002	0,031	н.д.	<LOD	<LOD	<LOD
4	0,003	0,018	<LOD	н.д.	н.д.	<LOD
5	<LOD	0,037	<LOD	<LOD	<LOD	<LOD
6	0,011	0,005	<LOD	<LOD	<LOD	<LOD
7	<LOD	0,037	<LOD	<LOD	<LOD	<LOD
8	0,003	<LOD	<LOD	<LOD	<LOD	<LOD
9	0,005	<LOD	<LOD	<LOD	<LOD	<LOD
10	0,002	н.д.	<LOD	<LOD	<LOD	<LOD
11	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
12	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD

Напомена: LOD – испод границе детекције; н.д. – није детектован



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Current status of environment

Sediment quality (HZ DTD, 2012)

mg/kg	1	2	3	4	5	6	7	8	9	10	11	12
BHC alfa izomer	0,001	н.д.	н.д.	н.д.	<LOD	0,005	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BHC beta izomer	0,004	<LOD	н.д.	<LOD	<LOD	0,0010	<LOD	<LOD	<LOD	<LOD	<LOD	0,001
Lindan	0,007	<LOD	0,001	<LOD	<LOD	0,02	<LOD	0,001	<LOD	<LOD	<LOD	0,001
BHC delta izomer	0,002	<LOD	0,002	<LOD	<LOD	н.д.	0,002	0,001	н.д.	<LOD	0,001	<LOD
Heptahlor	<LOD	<LOD	<LOD	<LOD	н.д.	н.д.	н.д.	<LOD	<LOD	<LOD	0,001	0,001
Heptahlor ekso-epoksid	н.д.	н.д.	н.д.	н.д.	<LOD	н.д.	н.д.	<LOD	н.д.	н.д.	<LOD	н.д.
Endrin	<LOD	<LOD	н.д.	н.д.	<LOD	н.д.	<LOD	н.д.	<LOD	<LOD	<LOD	<LOD
Aldrin	н.д.	<LOD	<LOD	<LOD	н.д.	<LOD	н.д.	<LOD	<LOD	<LOD	<LOD	<LOD
Dieldrin	<LOD	<LOD	<LOD	н.д.	<LOD	н.д.	<LOD	н.д.	<LOD	<LOD	<LOD	<LOD
Endrin aldehyd	<LOD	<LOD	<LOD	<LOD	<LOD	н.д.	н.д.	<LOD	<LOD	<LOD	<LOD	<LOD
Endosulfan	н.д.	н.д.	н.д.	н.д.	<LOD	0,001	н.д.	н.д.	н.д.	н.д.	н.д.	н.д.
p,p'-DDE	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
p,p'-DDD	н.д.	<LOD	н.д.	<LOD	<LOD	0,001	н.д.	<LOD	<LOD	<LOD	н.д.	<LOD
o,p'-DDT	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001

Напомена: LOD– испод границе детекције; н.д. – није детектован



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Current status of environment

Sediment transport regime (Babic, 2007)

				Укупан нанос минус транзитни суспендовани нанос	
područje	Profil merenja	Qs (kg/s)	Qs (m ³ /god.)	Доња граница (20%) у (m ³ /god)	Горња граница (45%) у (m ³ /god)
Mađarska granica - Drava	Bezdan	230	2.737.087	547.417	1.231.689
Drava - Novi Sad	Bogojevo	220	2.618.083	523.617	1.178.137
Novi Sad - Tisa	Novi Sad	203	2.415.777	483.155	1.087.099
Tisa - Sava	Zemun	333	3.962.826	792.565	1.783.272



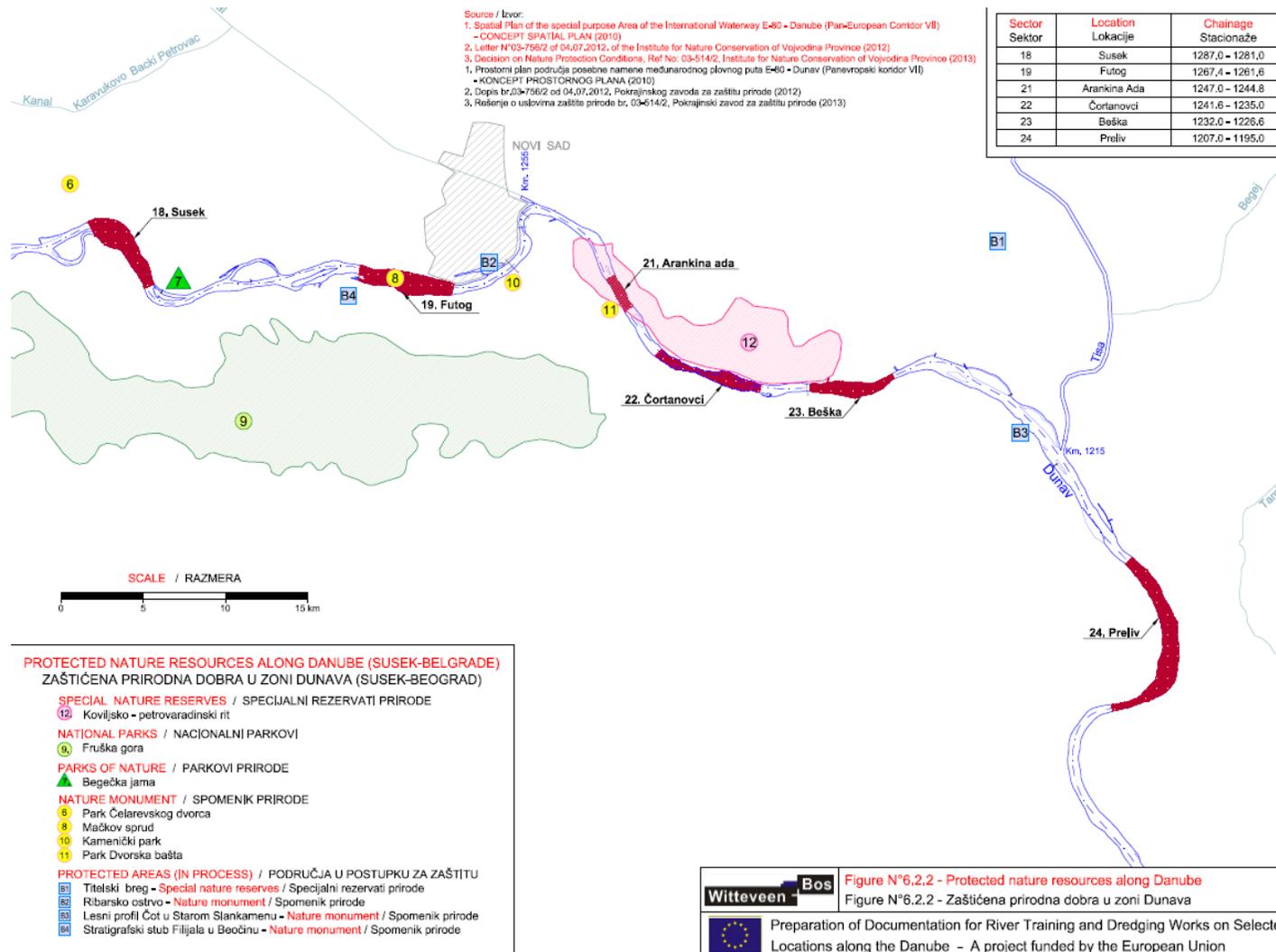
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Protected areas



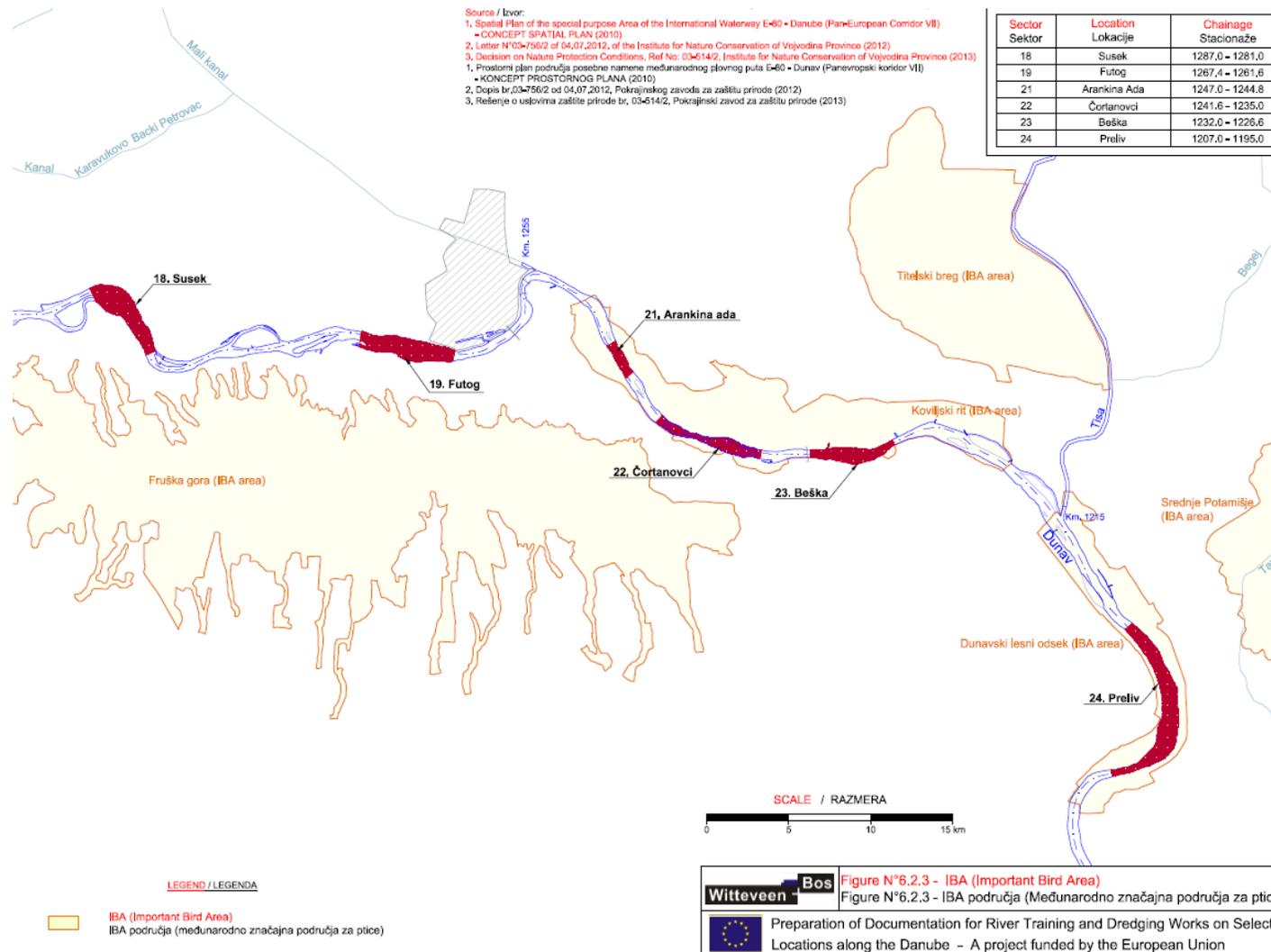
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IBA areas



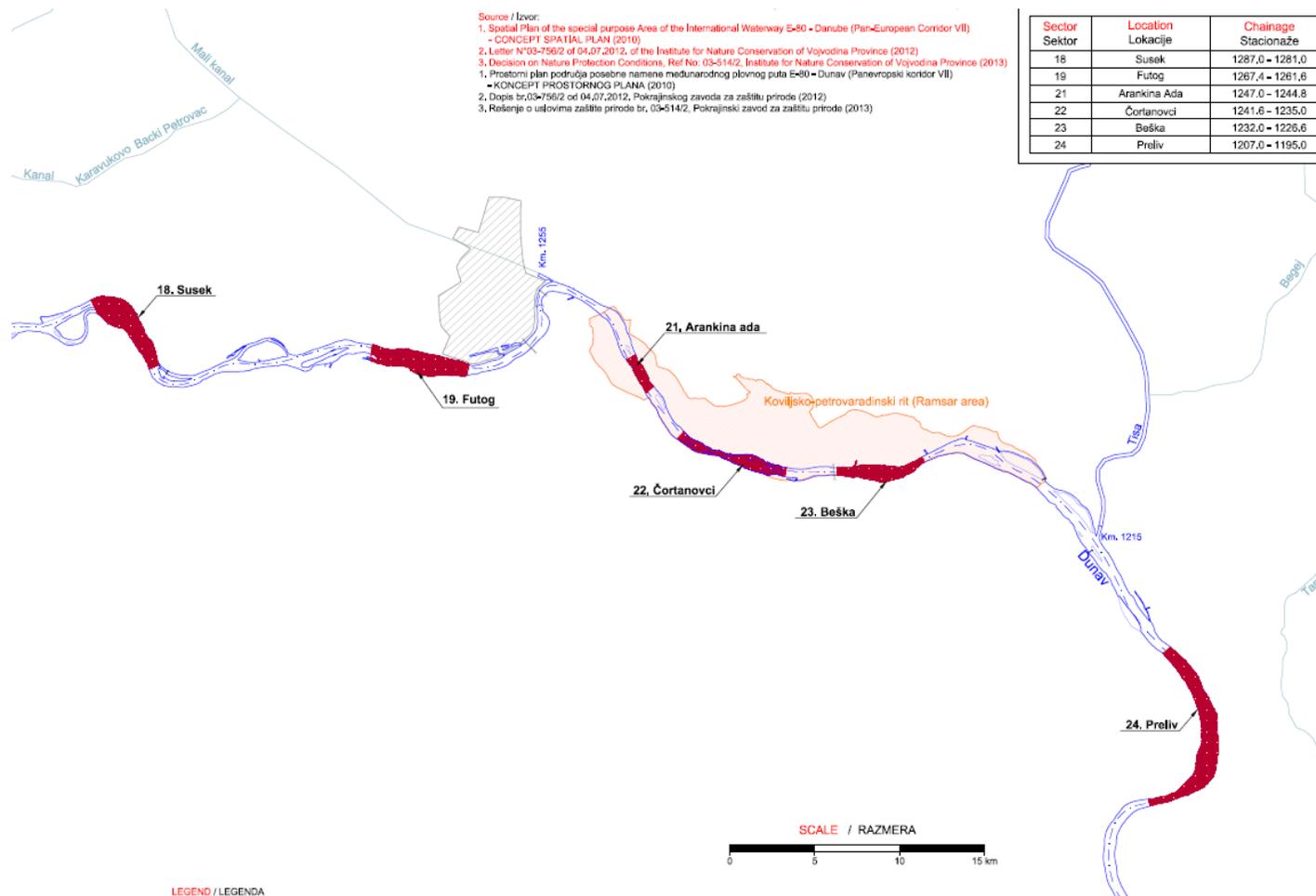
Project funded by
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Ramsar areas



Source / Izvor:
 1. Spatial Plan of the special purpose Area of the International Waterway E-80 - Danube (Pan-European Corridor VII) - CONCEPT SPATIAL PLAN (2010)
 2. Letter N°03-756/2 of 04.07.2012, of the Institute for Nature Conservation of Vojvodina Province (2012)
 3. Decision on Nature Protection Conditions, Ref No: 03-514/2, Institute for Nature Conservation of Vojvodina Province (2013)
 1. Prostorni plan područja posebna namene međunarodnog plovnog puta E-80 - Dunav (Panevropski koridor VII) - KONCEPT PROSTORNOG PLANA (2010)
 2. Dopis br.03-756/2 od 04.07.2012, Pokrajinskog zavoda za zaštitu prirode (2012)
 3. Rešenje o uslovima zaštite prirode br. 03-514/2, Pokrajinski zavod za zaštitu prirode (2013)

LEGEND / LEGENDA

Ramsar areas - Areas registered in the Ramsar list based on Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention)
 Ramsar područja - Područja upisana u Ramsarsku listu na osnovu konvencije o močvarama koje su od međunarodnog značaja naročito kao staništa ptica močvarica (Ramsarska konvencija)

Witteveen Bos Figure N°6.2.4 - Ramsar areas
 Figure N°6.2.4 - Ramsar područja

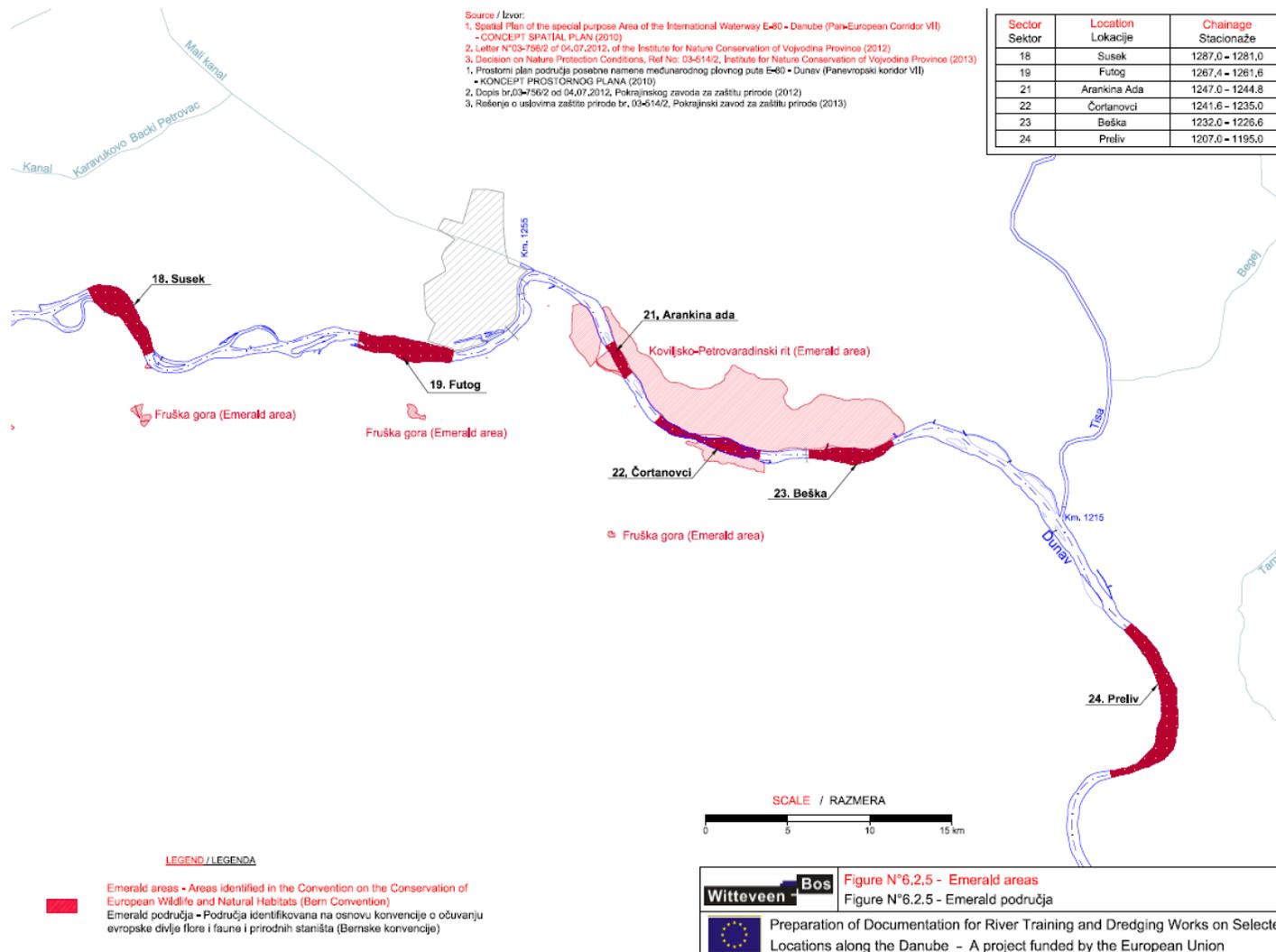
Preparation of Documentation for River Training and Dredging Works on Selected Locations along the Danube - A project funded by the European Union



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Emerald areas



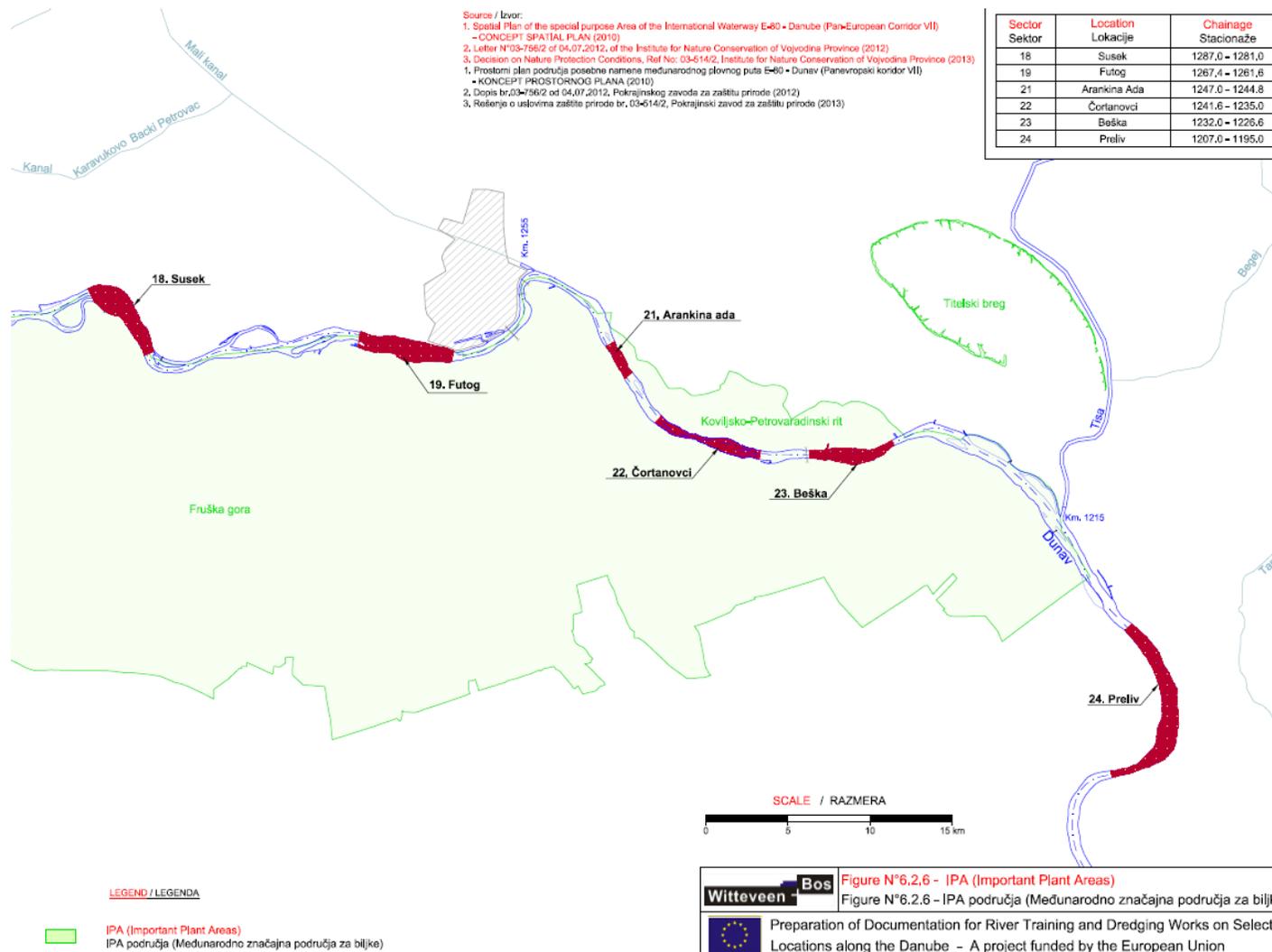
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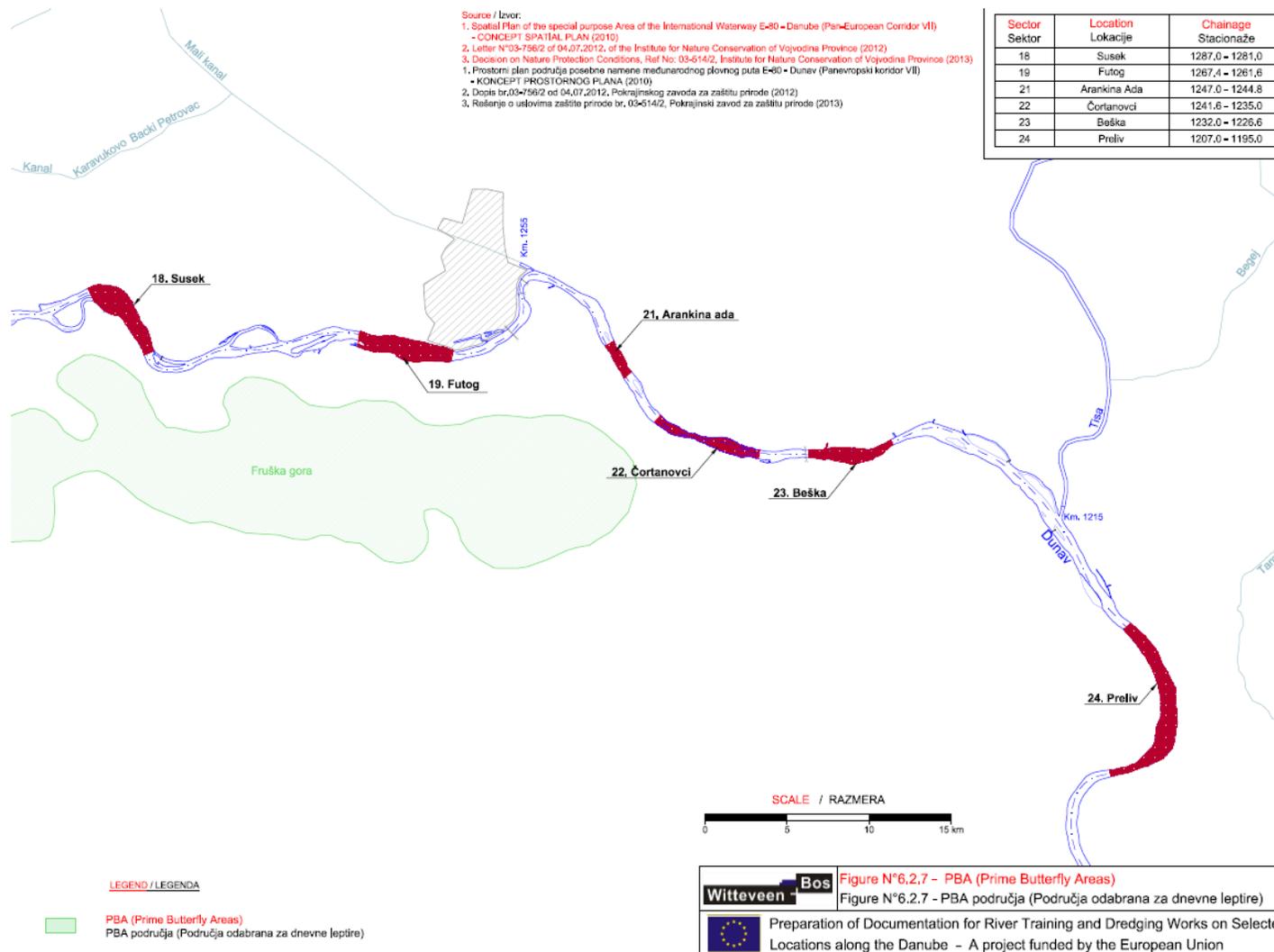
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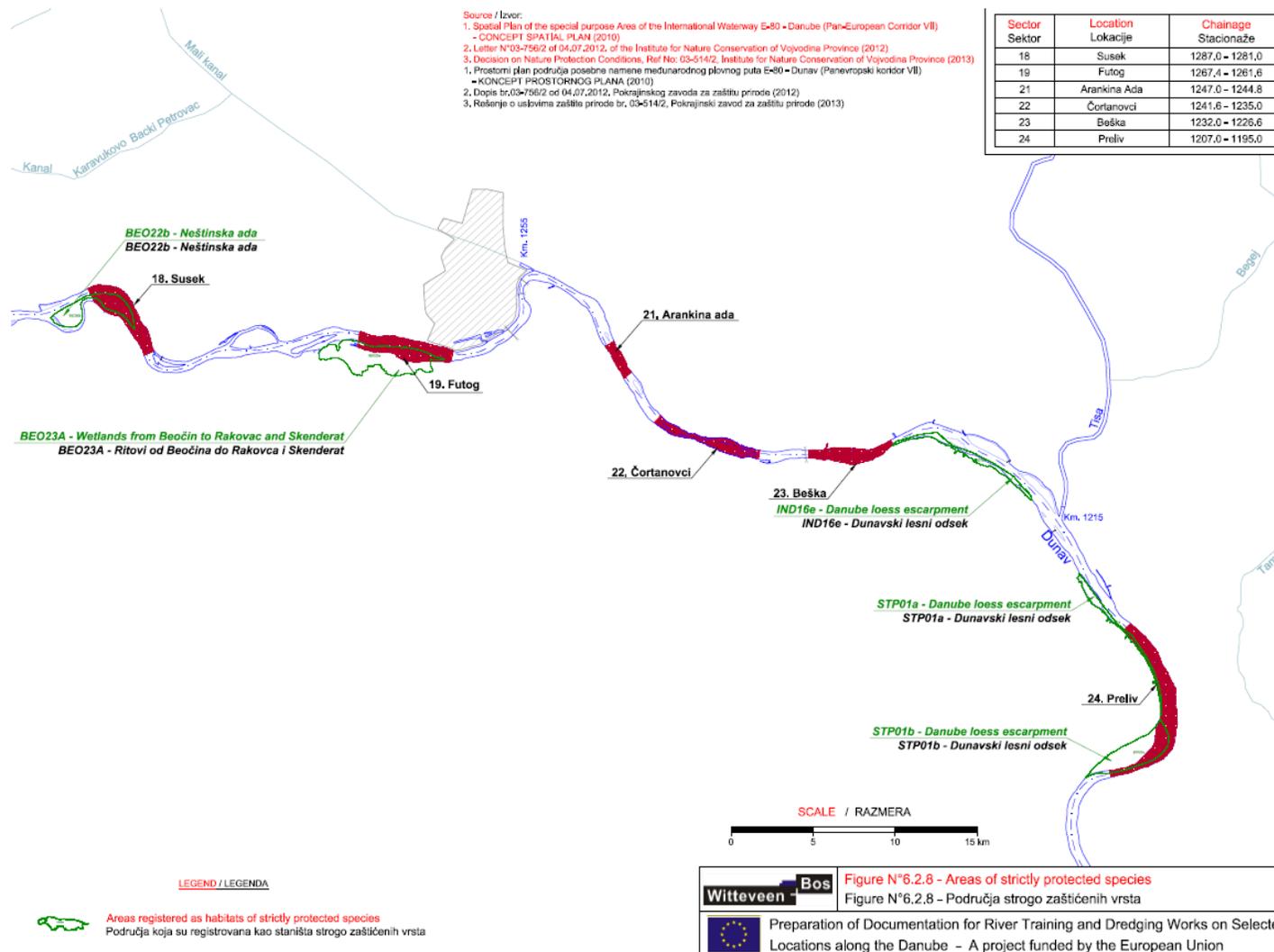
IPA areas



PBA areas



Areas of strictly protected species



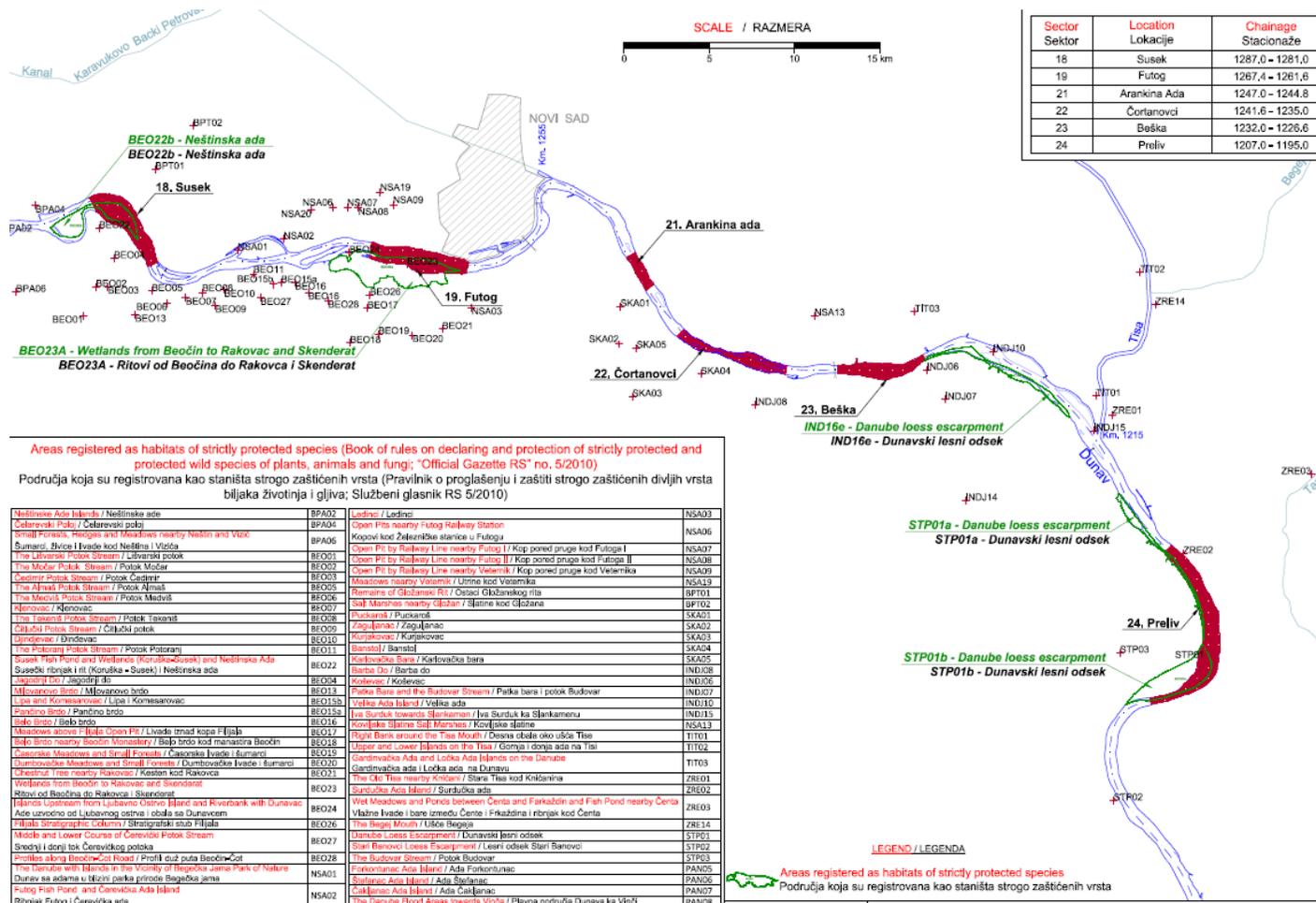
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Areas of strictly protected species



Areas registered as habitats of strictly protected species (Book of rules on declaring and protection of strictly protected and protected wild species of plants, animals and fungi; "Official Gazette RS" no. 5/2010)

Područja koja su registrovana kao staništa strogo zaštićenih vrsta (Pravilnik o proglašenju i zaštiti strogo zaštićenih divljih vrsta biljaka životinja i gljiva; Službeni glasnik RS 5/2010)

Neštinska Ada Injurti / Neštinska ada	BPA03	Ledina / Ledina	NSA03
Celarevski Potok / Celarevski potok	BPA04	Open Pit nearby Futog Railway Station	NSA06
Small Forests, Hedgerows and Meadows nearby Naštin and Vitoz	BPA06	Kopovi kod Zeleniške stanice u Futogu	NSA07
Šumari, živeci i livade kod Neština i Vitoza	BPA06	Open Pit by Railway Line nearby Futog I / Kop porud pruge kod Futoga I	NSA07
The Ljubarci Potok Stream / Ljubarci potok	BEO01	Open Pit by Railway Line nearby Futog II / Kop porud pruge kod Futoga II	NSA08
The Moker Potok Stream / Moker potok	BEO03	Open Pit by Railway Line nearby Veležnik / Kop porud pruge kod Veležnika	NSA09
Cedina Potok Stream / Potok Cedina	BEO05	Meadows nearby Veležnik / Lina kod Veležnika	NSA13
The Žitvač Potok Stream / Potok Žitvač	BEO05	Remains of Gložanac Rt / Ostaci Gložanskog rta	BPT01
The Meruša Potok Stream / Potok Meruša	BEO06	Salt Marshes nearby Gljčavan / Šlitine kod Gljčavana	BPT02
Meruša / Meruša	BEO07	Phocenik / Pupvarci	SKA01
The Lovanič Potok Stream / Potok Lovanič	BEO08	Zaplanje / Zaplanje	SKA02
Čitluk Potok Stream / Čitluk potok	BEO09	Korjakovac / Korjakovac	SKA03
Čitluk / Čitluk	BEO10	Bansto / Bansto	SKA04
The Podgoran Potok Stream / Potok Podgoran	BEO11	Karlovka bara / Karlovka bara	SKA05
Super Pan Pond and Wetlands (Korjakovac and Neštinska Ada)	BEO22	Bere do / Bere do	IND08
Susek, rječak i li (Korjaka + Susek) / Neštinska ada	BEO22	Kolcevi / Kolcevi	IND09
Jagodnjak / Jagodnjak	BEO24	Peška bara and the Budovar Stream / Peška bara i potok Budovar	IND07
Milovanovo Brdo / Milovanovo brdo	BEO13	Vilinska Ada Island / Vilinska ada	IND10
Lipa and Korjakačevac / Lipa i Korjakačevac	BEO15	Lipa Surok towards Slavkovo / Jva Surok ka Slavkovo	IND13
Paštin Brdo / Paštin brdo	BEO15	Kovljake Šlitine Salt Marshes / Kovljake šlitine	NSA13
Bebo Brdo / Bebo brdo	BEO16	Right Bank around the Tisa Mouth / Desna obala oko usta Tise	TIT01
Meadows along Bebo Stream / Bebo Stream / Livade uzvod kod Bebo	BEO17	Upper and lower islands on the Tisa / Donja i gornja ada na Tisi	TIT02
Meadows along Bebo Stream / Bebo Stream / Livade uzvod kod Bebo	BEO17	Gardivaška Ada and Loka Ada Islands on the Danube	TIT03
Čukarica Meadows and Small Forests / Čukarica i Dumbovačke livade i šumari	BEO20	The Old Tisa nearby Križevci / Stara Tisa kod Križevina	ZRE01
Čestina / Čestina	BEO21	Surovača Ada Island / Surovača ada	ZRE02
Wetlands from Beočin to Rakovac and Skenderat	BEO23	Wet Meadows and Ponds between Čenta and Farkaždin and Fish Pond nearby Čenta	ZRE03
Wetlands from Beočin to Rakovac and Skenderat	BEO23	Vlažne livade i bare između Čente i Farkaždina i ribnjak kod Čenta	ZRE14
Beočin Wetlands from Lubavac to Vitež and Riverbank with Dunavac	BEO24	The Bačaj Mouth / Ušće Bačaja	ZRE14
Ada uzvodno od Lubavca do Viteža i obala sa Dunavcem	BEO24	Danube Loess Escarpment / Danavski lesni odsek	STP01
Beočin and Lower Courses of Čerević Potok Stream	BEO26	Stari Banovci Loess Escarpment / Lesni odsek Stari Banovci	STP02
Beočin i donji tok Čerevićskog potoka	BEO27	The Budovar Stream / Potok Budovar	STP03
Profil along Beočin Road / Profil duž puta Beočin	BEO28	Ferikonovac Ada Island / Ada Ferikonovac	PAN05
The Terrace with Islands in the vicinity of Beočinama Park of Nature	NSA01	Surovača Ada Island / Ada Surovača	PAN06
Dunavac sa adama u blizini parka prirode Beočinama	NSA01	Čalkjanec Ada Island / Ada Čalkjanec	PAN07
Futog Fish Pond and Čerevićka Ada Island	NSA02	The Danube Flood Areas towards Vitoz / Plivna područja Dunava ka Vitoz	PAN08
Ribnjak Futog i Čerevićka ada	NSA02		

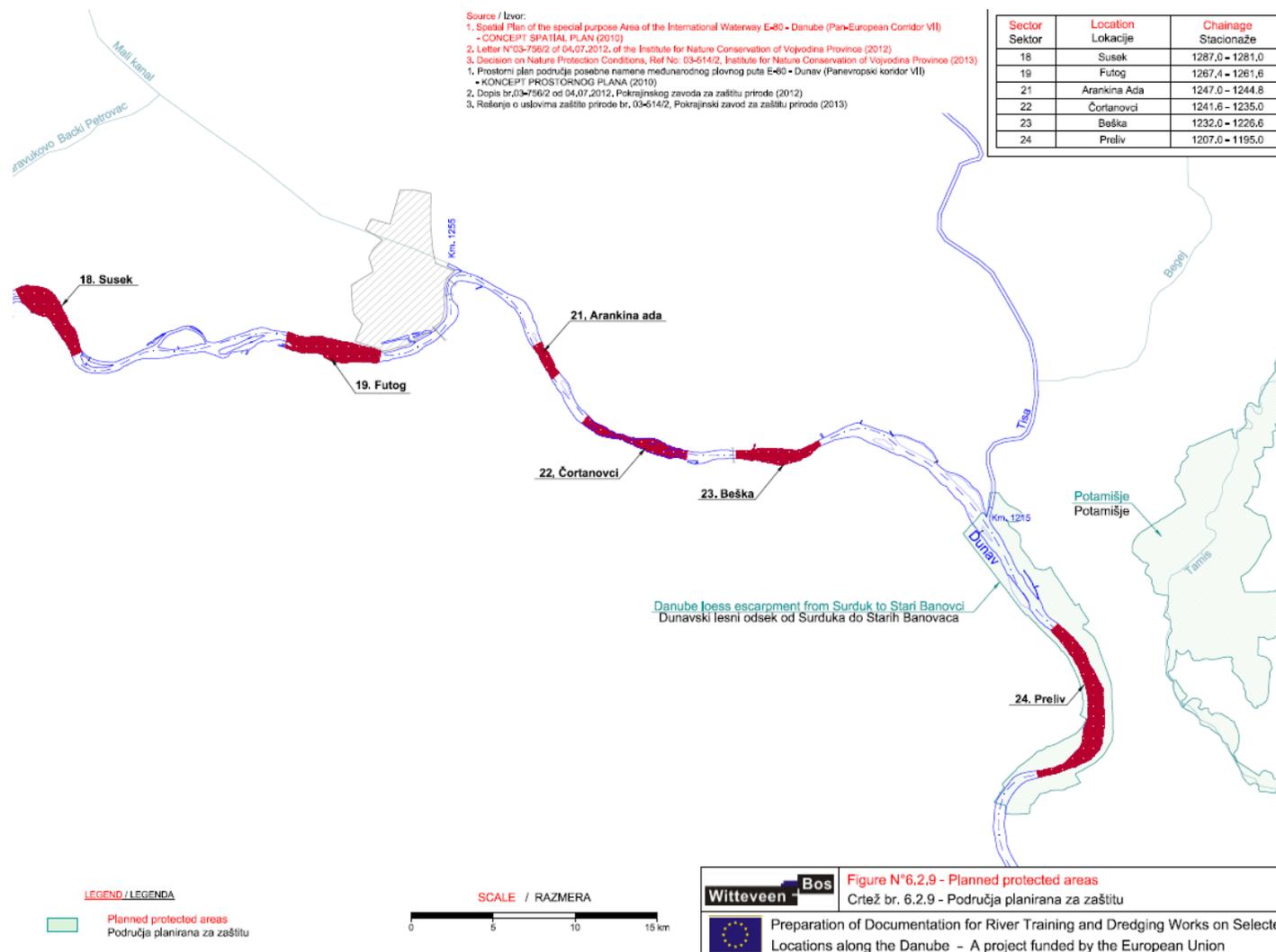
Source / Izvor:

1. Spatial Plan of the special purpose Area of the International Waterway E-60 - Danube (Pan-European Corridor VI) - CONCEPT SPATIAL PLAN (2010)
2. Letter N/03/5602 of 04.07.2012, of the Institute for Nature Conservation of Vojvodina Province (2012)
3. Decision on Nature Protection Conditions, Ref No: 03-6142, Institute for Nature Conservation of Vojvodina Province (2013)
1. Prostorni plan područja posebne namene međunarodnog plovnog puta E-60 - Dunav (Pan-evropski koridor VI) - KONCEPT PROSTORNOG PLANA (2010)
2. Dopis br.03/5602 od 04.07.2012, Pokrajinski zavod za zaštitu prirode (2012)
3. Rešenje o uslovima zaštite prirode br. 03-6142, Pokrajinski zavod za zaštitu prirode (2013)

Figure N°6.2.8a - Areas of strictly protected species
Figure N°6.2.8a - Područja strogo zaštićenih vrsta

Preparation of Documentation for River Training and Dredging Works on Selected Locations along the Danube - A project funded by the European Union

Areas planned for protection



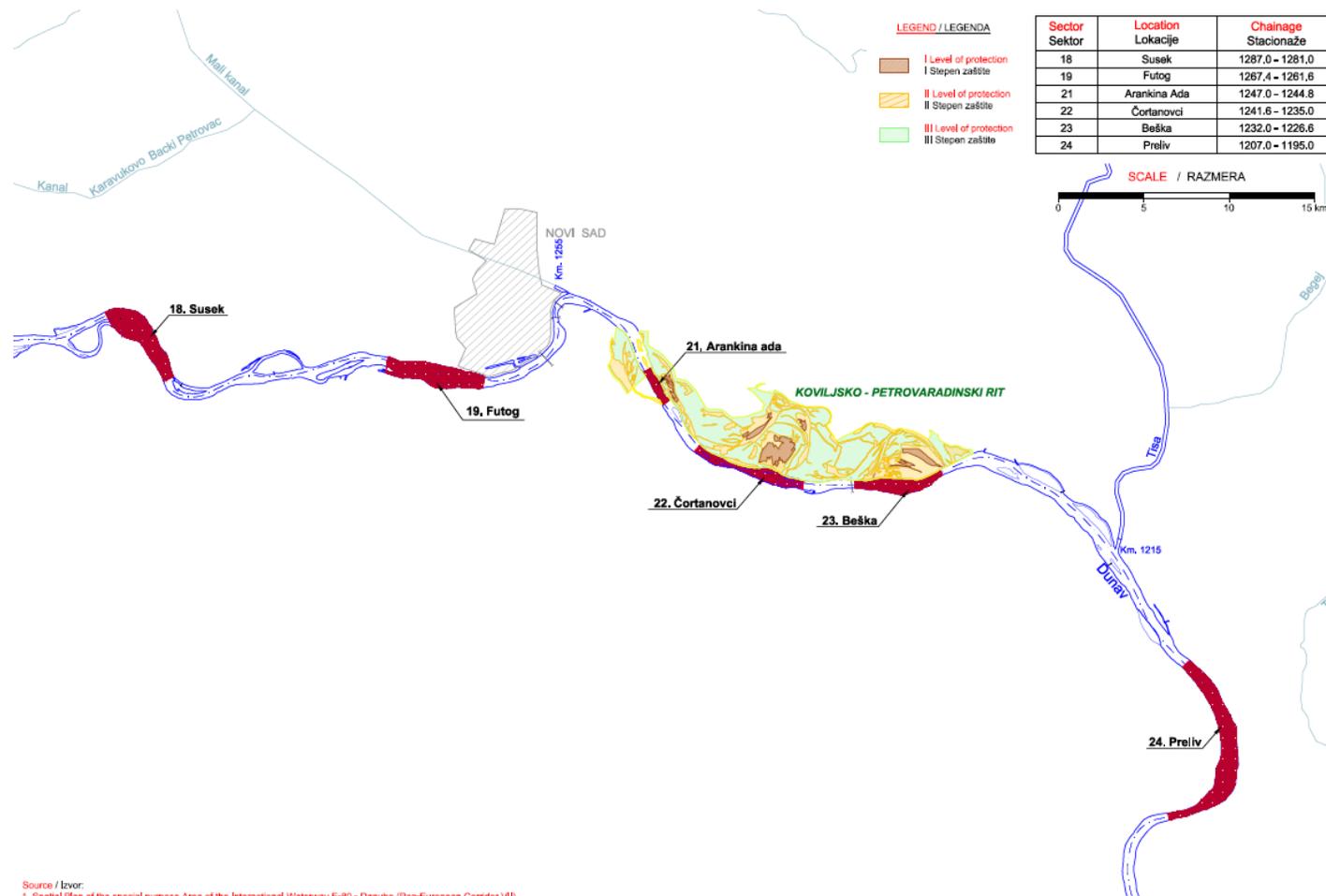
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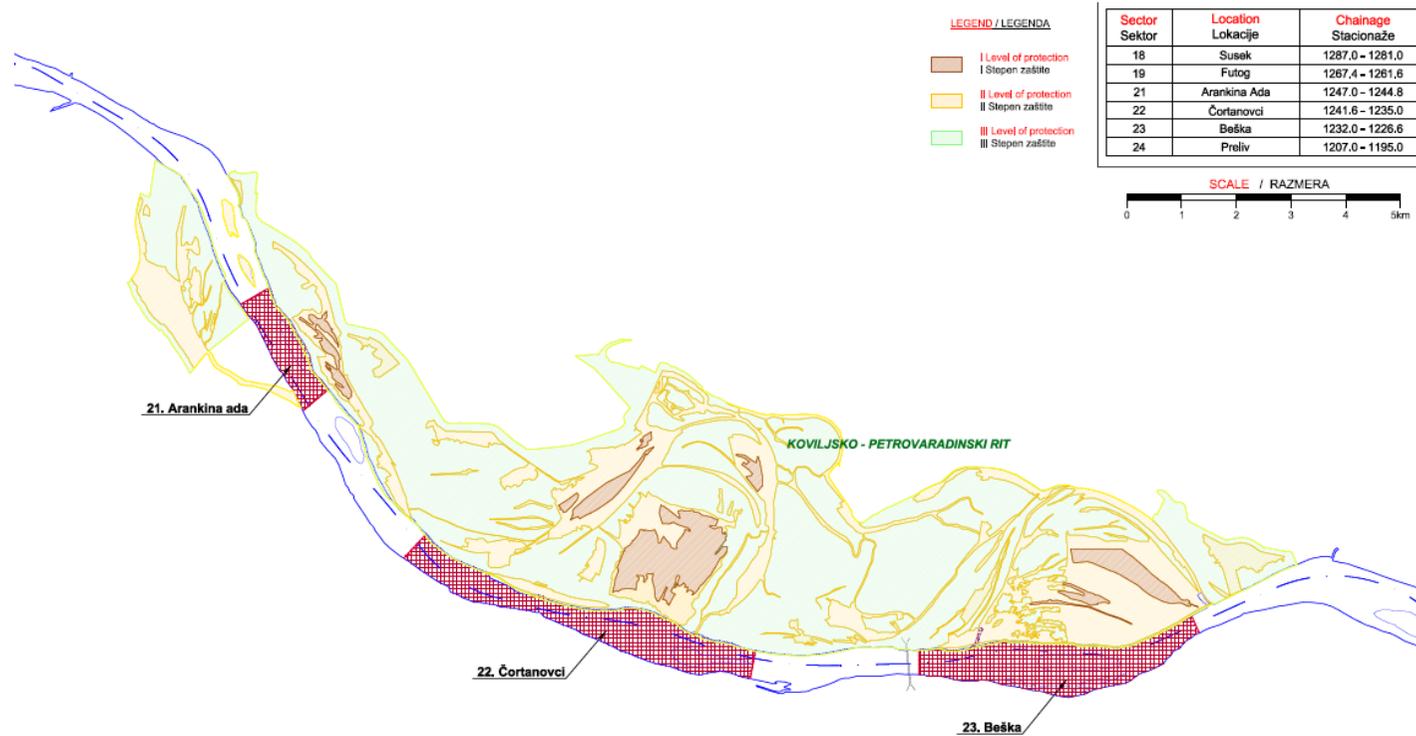
Levels of nature resorts protection



Source / Izvor:
 1. Spatial Plan of the special purpose Area of the International Waterway E-90 - Danube (Pan-European Corridor VII) - CONCEPT SPATIAL PLAN (2010)
 2. Letter N°03-756/2 of 04.07.2012, of the Institute for Nature Conservation of Vojvodina Province (2012)
 3. Decision on Nature Protection Conditions, Ref No: 03-614/2, Institute for Nature Conservation of Vojvodina Province (2013)
 4. Prostorni plan područja posebne namene međunarodnog plovnog puta E-90 - Dunav (Pan-evropski koridor VII) - KONCEPT PROSTORNOG PLANA (2010)
 2. Dopis br.03-756/2 od 04.07.2012, Pokrajinskog zavoda za zaštitu prirode (2012)
 3. Rešenje o uslovima zaštite prirode br. 03-614/2, Pokrajinski zavod za zaštitu prirode (2013)

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 Figure N°6.2.10 - Level of protection for the Special nature reserves (overview)
 Crtež br. 6.2.10 - Stepeni zaštite za Specijalne rezervate prirode (pregledna karta)
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Levels of nature resorts protection



Source / Izvor:

1. Spatial Plan of the special purpose Area of the International Waterway E-80 - Danube (Pan-European Corridor VII) - CONCEPT SPATIAL PLAN (2010)
2. Letter N°03-756/2 of 04.07.2012, of the Institute for Nature Conservation of Vojvodina Province (2012)
3. Decision on Nature Protection Conditions, Ref No: 03-514/2, Institute for Nature Conservation of Vojvodina Province (2013)
1. Prostorni plan područja posebne namene međunarodnog plovnog puta E-80 - Dunav (Pan-evropski koridor VII) - KONCEPT PROSTORNOG PLANA (2010)
2. Dopis br.03-756/2 od 04.07.2012, Pokrajinskog zavoda za zaštitu prirode (2012)
3. Rešenje o uslovima zaštite prirode br. 03-514/2, Pokrajinski zavod za zaštitu prirode (2013)

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Figure N°6.2.10a - Level of protection for the Special nature reserves
Crtež br. 6.2.10a - Stepeni zaštite za Specijalne rezervate prirode

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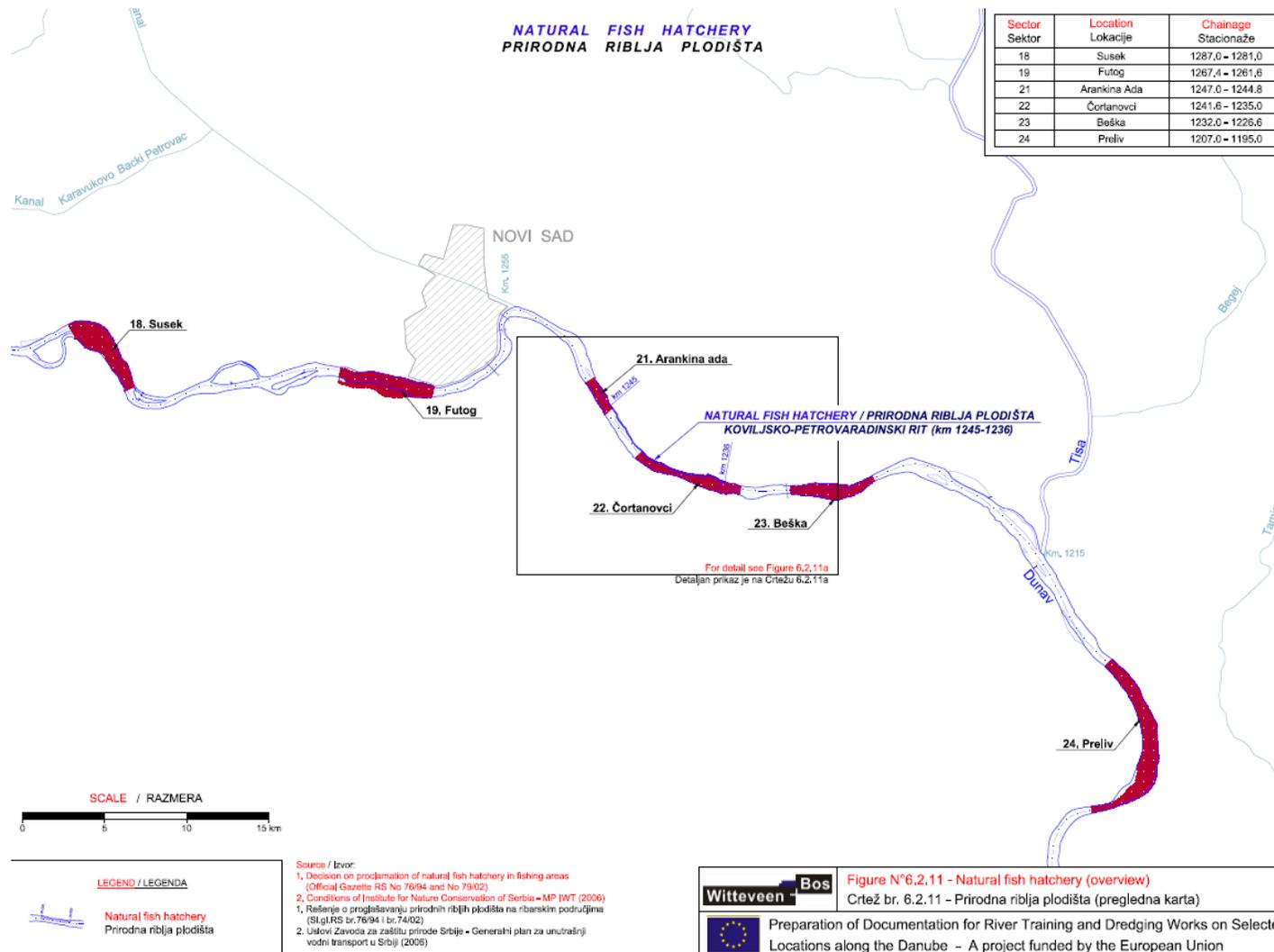
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DHI

Plavput 50 YEARS

Natural fish spawning areas



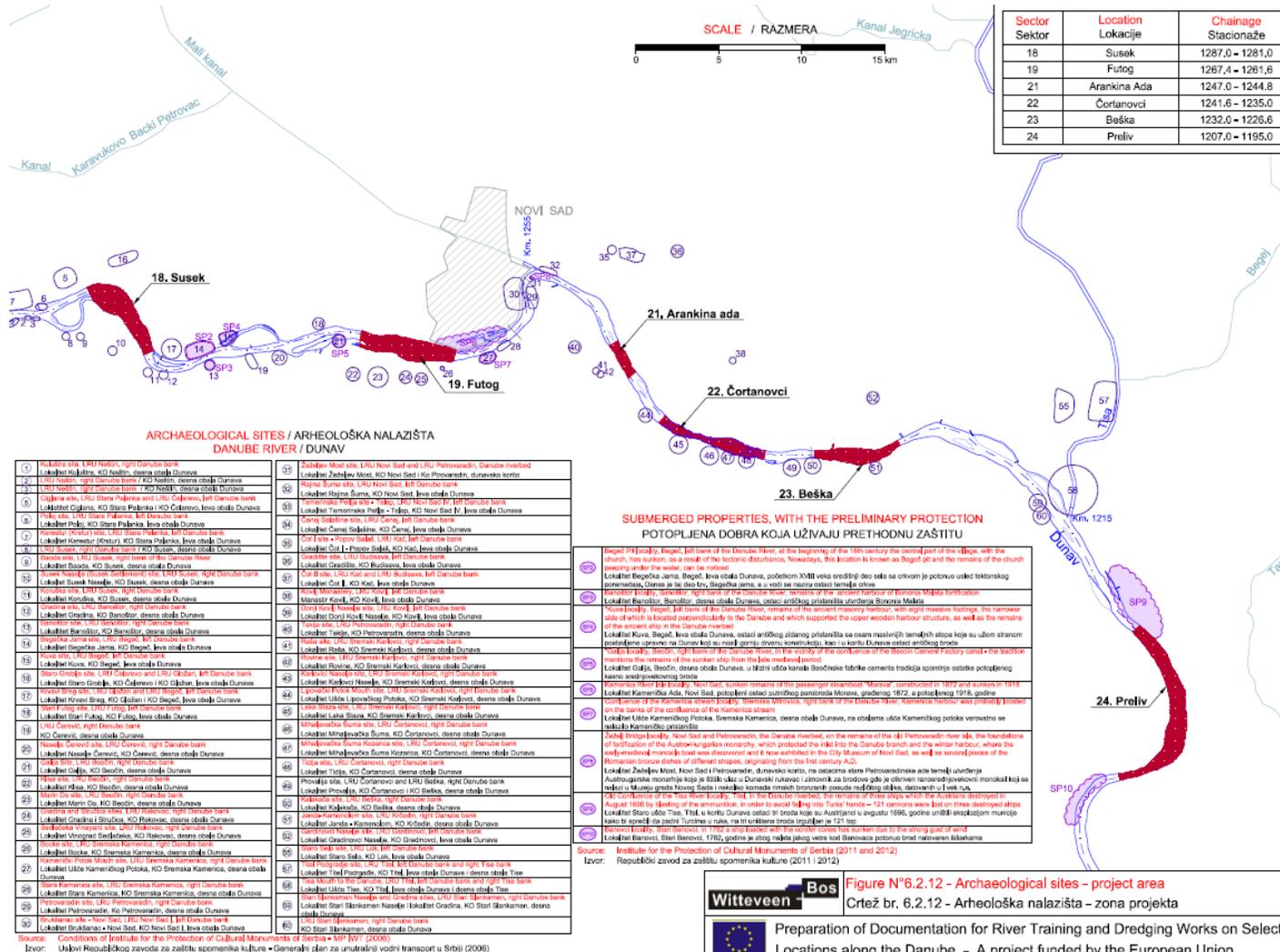
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Archaeological sites



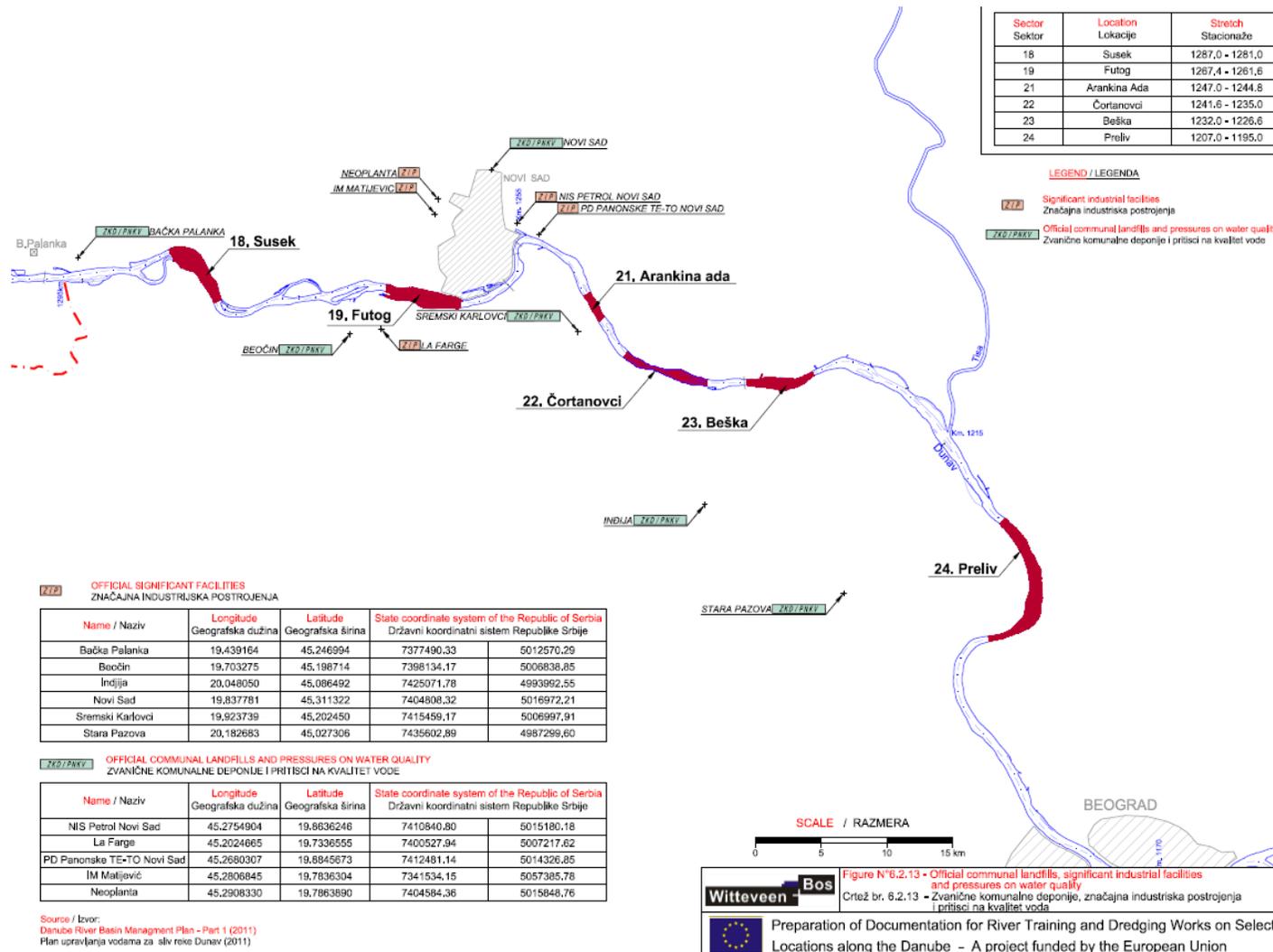
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DHI
Figure N°6.2.12 - Archaeological sites - project area
Crtež br. 6.2.12 - Arheološka nalazišta - zona projekta
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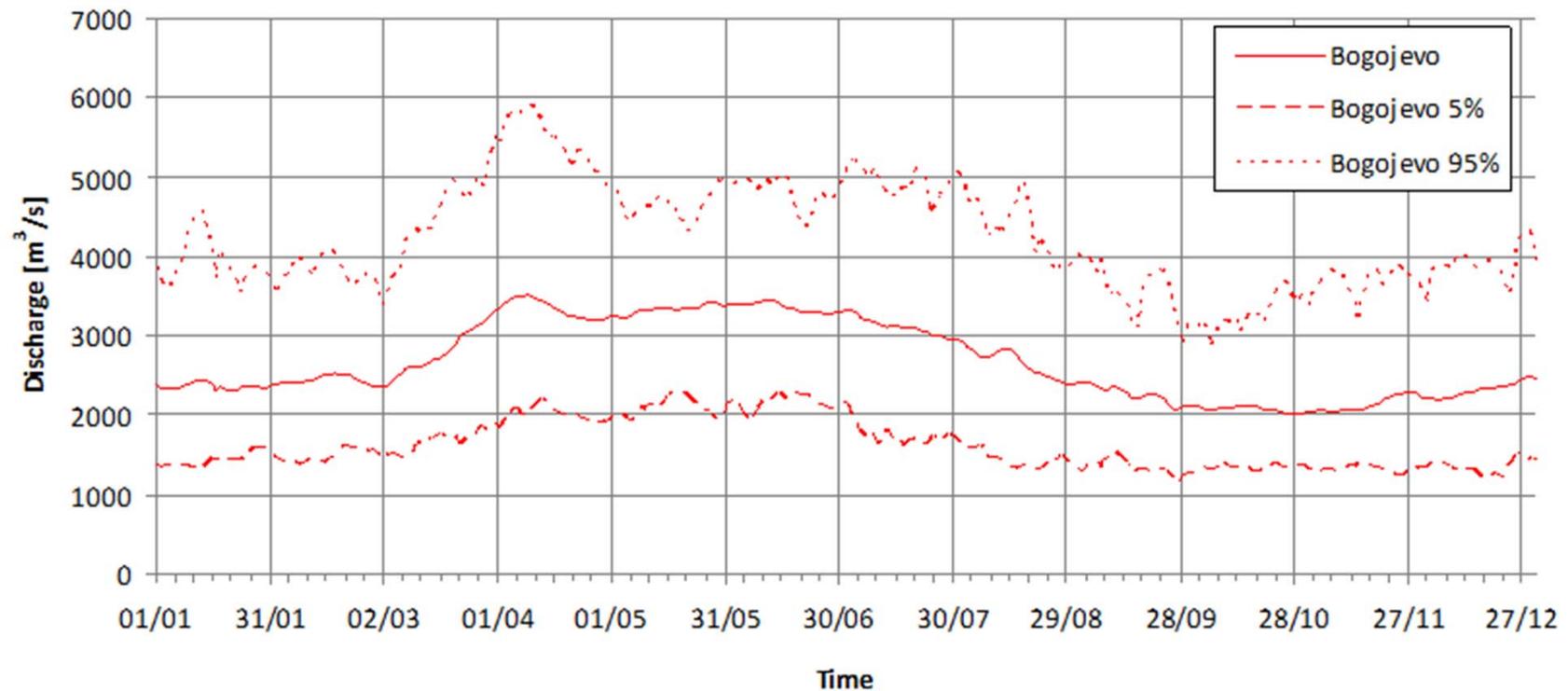
Plavput 50 YEARS

Main pollutants



Current status of environment

Average hydrograph (Consortium, 2011)



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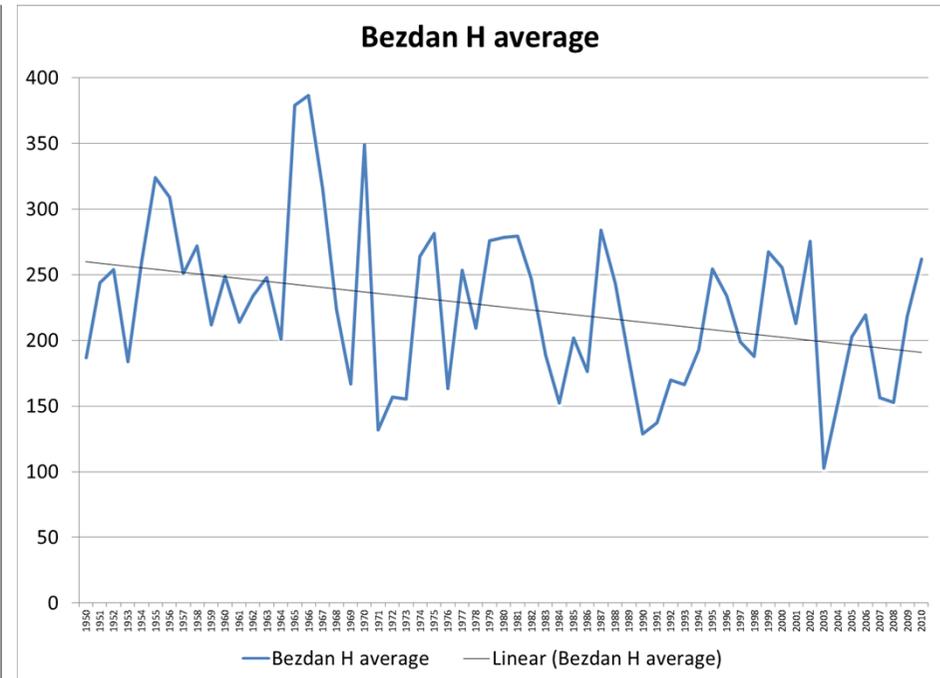
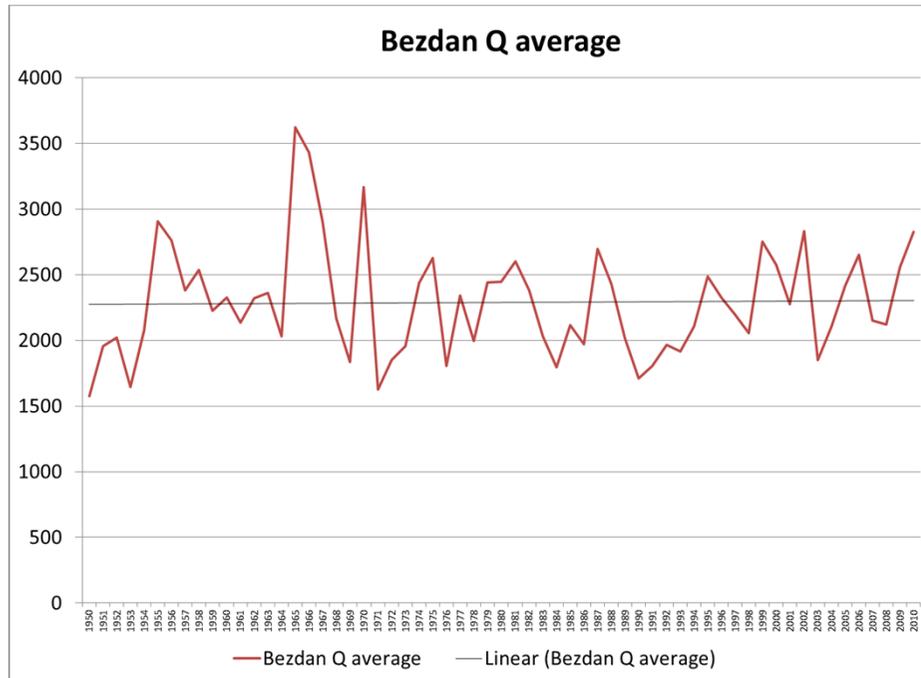
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Current status of environment

Hydro-morphological trends (Plovput, 2013)



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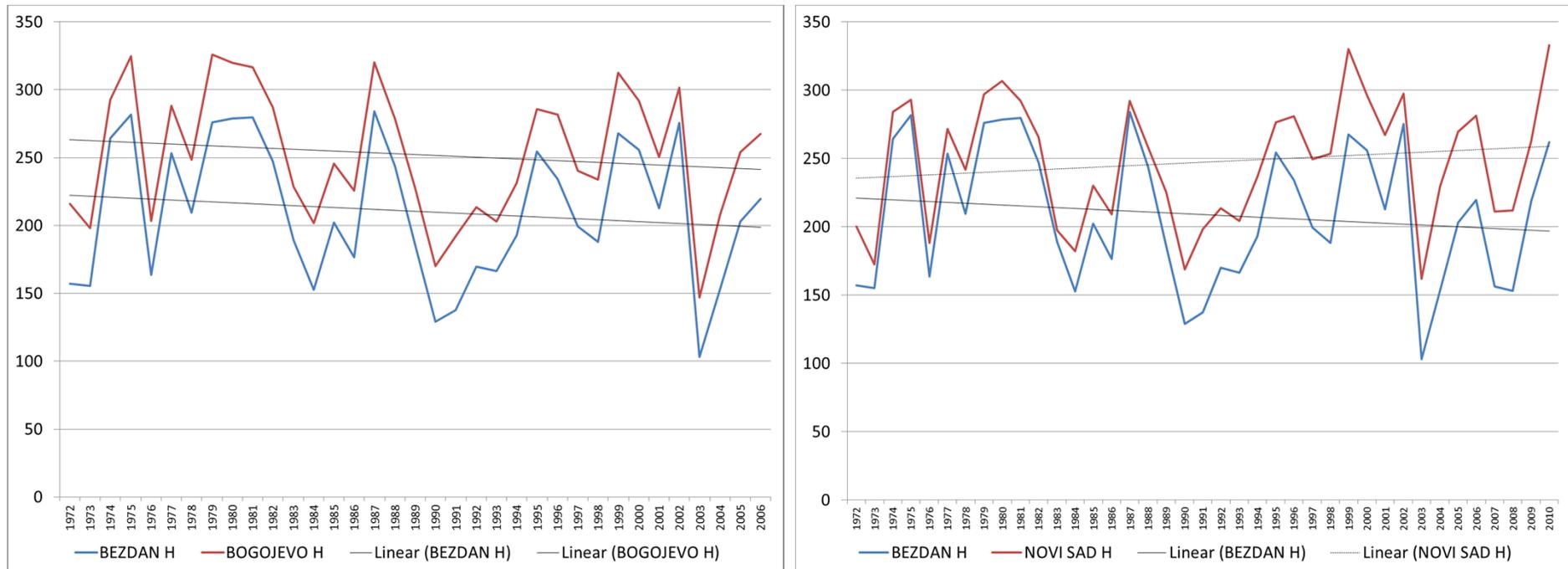
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Current status of environment

Hydro-morphological trends (Plovput, 2013)



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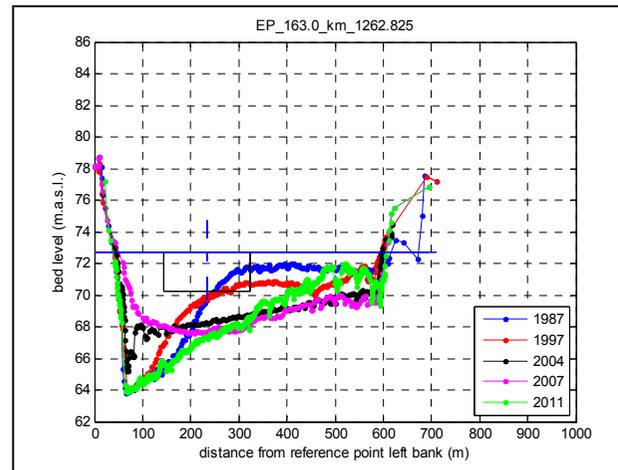
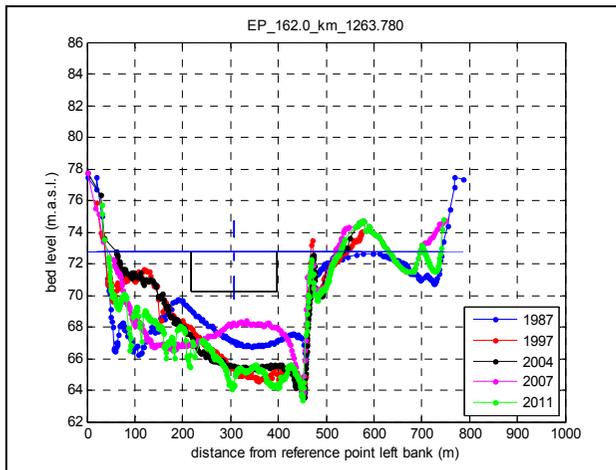
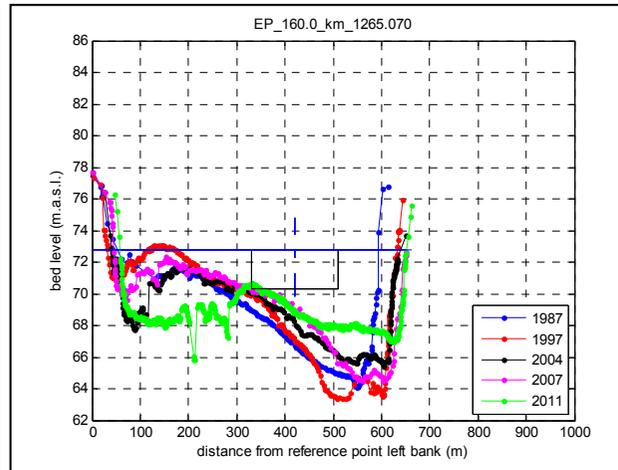
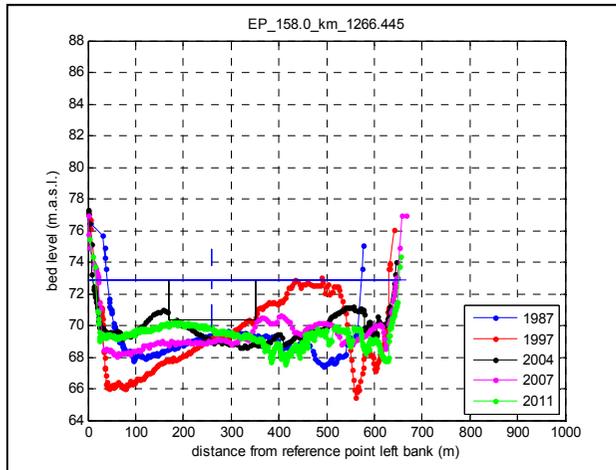
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Current status of environment

Hydro-morphological trends– EP cross-sections, period 1987-2011 (Plovput, 2011)



Sector no: 19

Name of sector: **Futog**

Chainage:
km 1,267.4 – km 1,261.6



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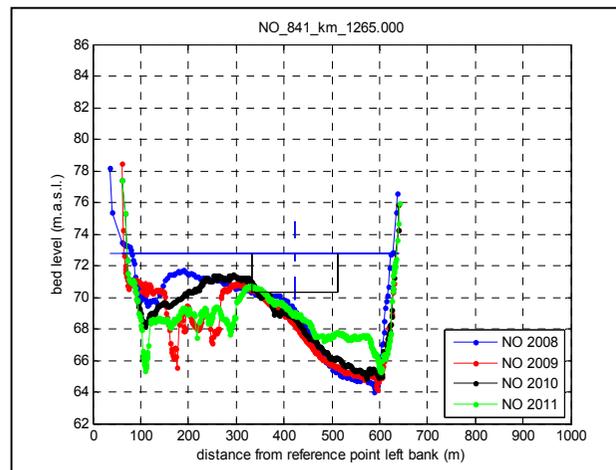
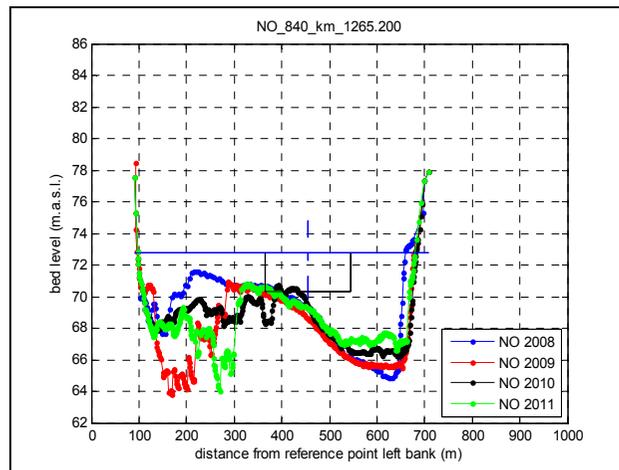
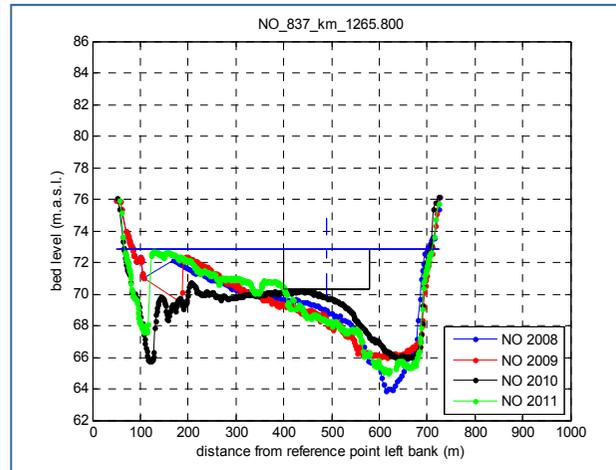
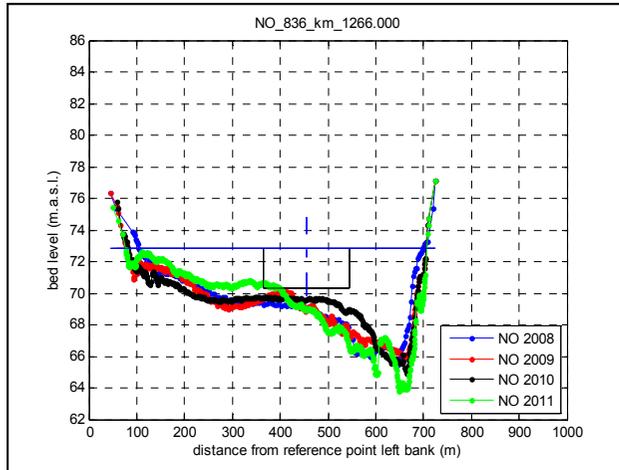
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Postojeće stanje životne sredine

Hydro-morphological trends – NO cross-sections, period 2007-2011 (Plovput, 2011)



Sector no: 19

Name of sector: **Futog**

Chainage:
km 1,267.4 – km 1,261.6

Navigation conditions:
insufficient fairway
depth and width



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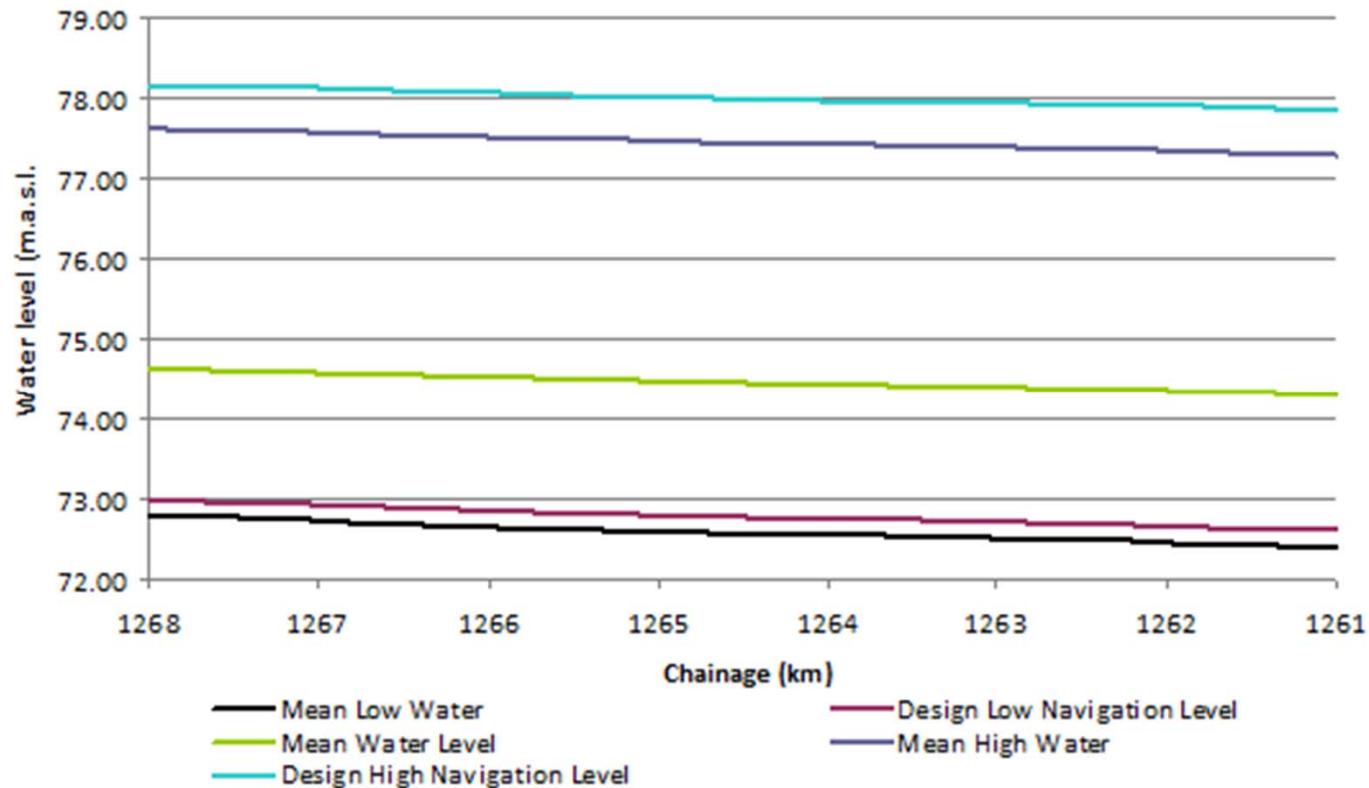
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Hydrodynamic and morphological modeling

Designed characteristic water levels (Consortium, 2011)



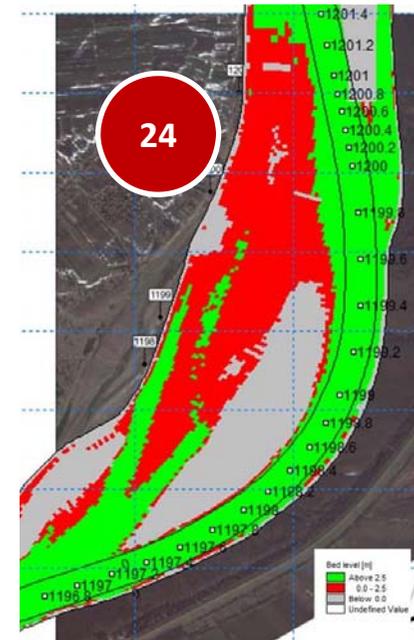
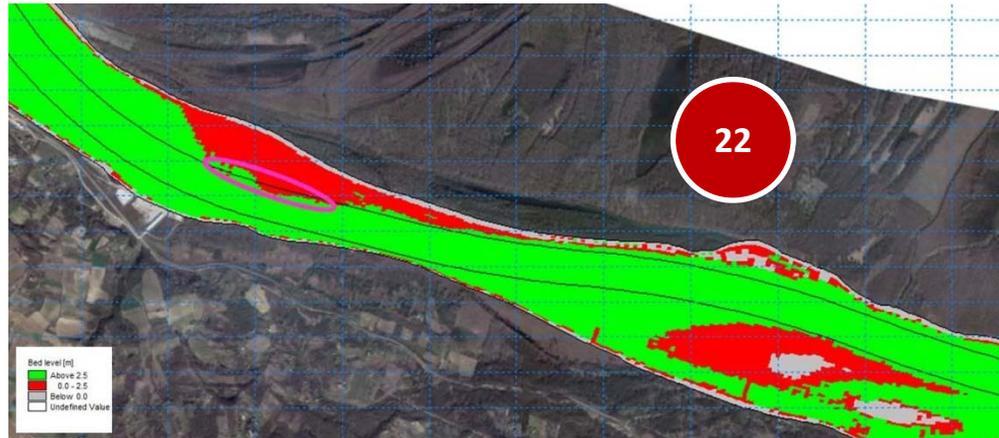
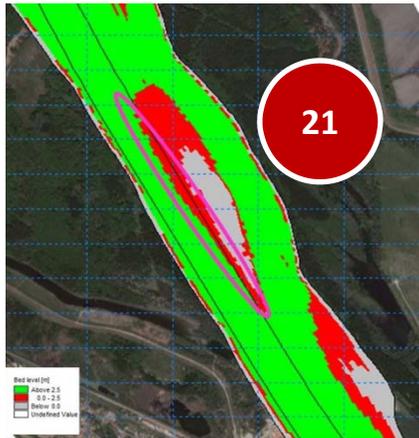
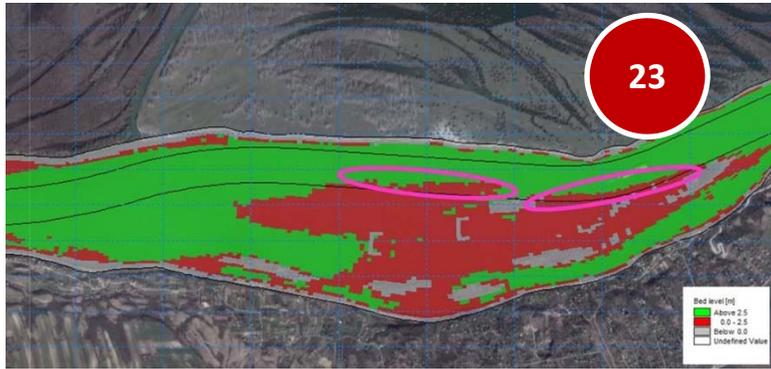
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Current navigation conditions



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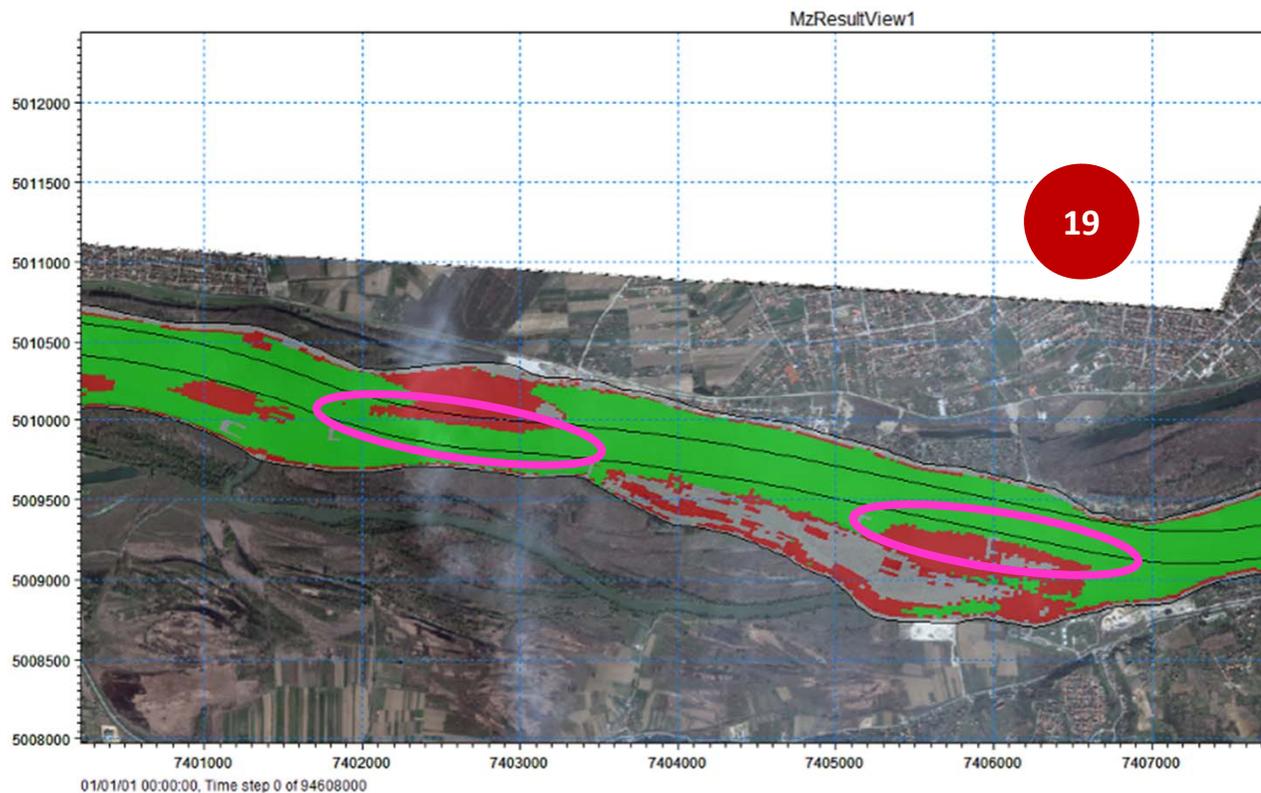
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Current navigation conditions

Critical sector FUTOG



Sector no: 19

Name of sector: **Futog**

Chainage:

km 1,267.4 – km 1,261.6

Navigation conditions:

insufficient fairway

depth and width,

transverse sedimentation

tendency



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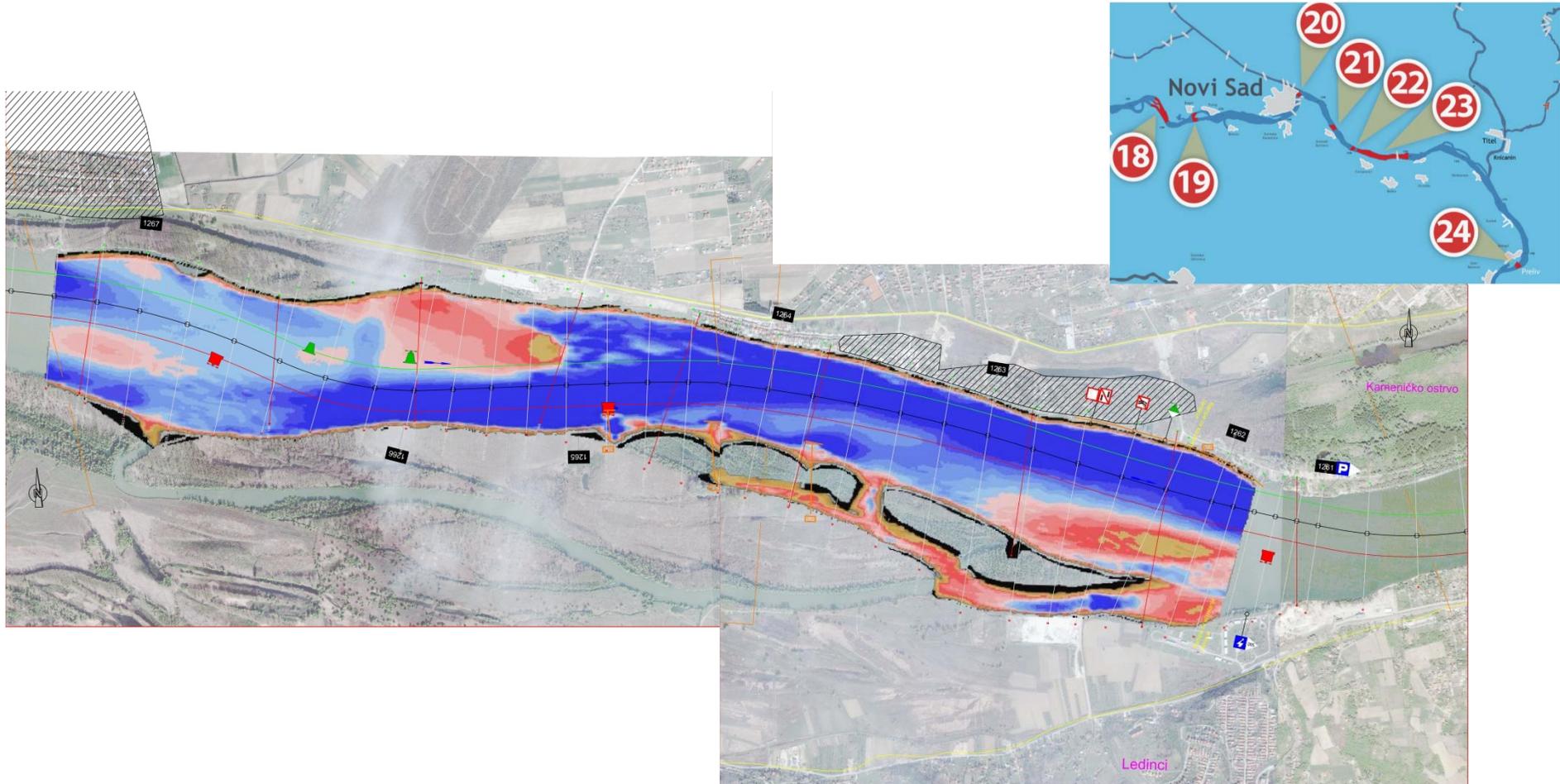
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Current navigation conditions

Critical sector FUTOG – **available depths, August 2012**



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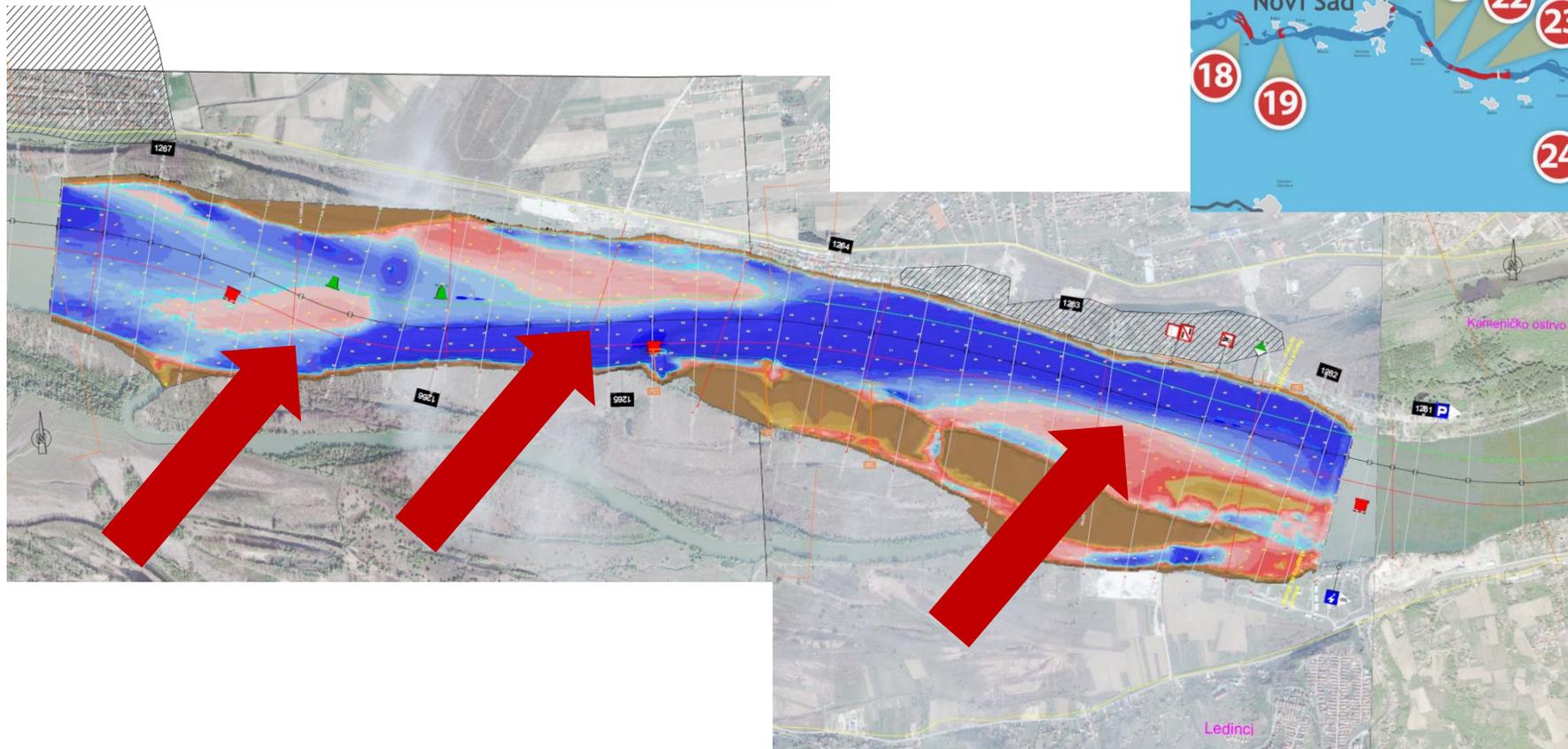
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Current navigation conditions

Critical sector FUTOG – **available depths, August 2033**



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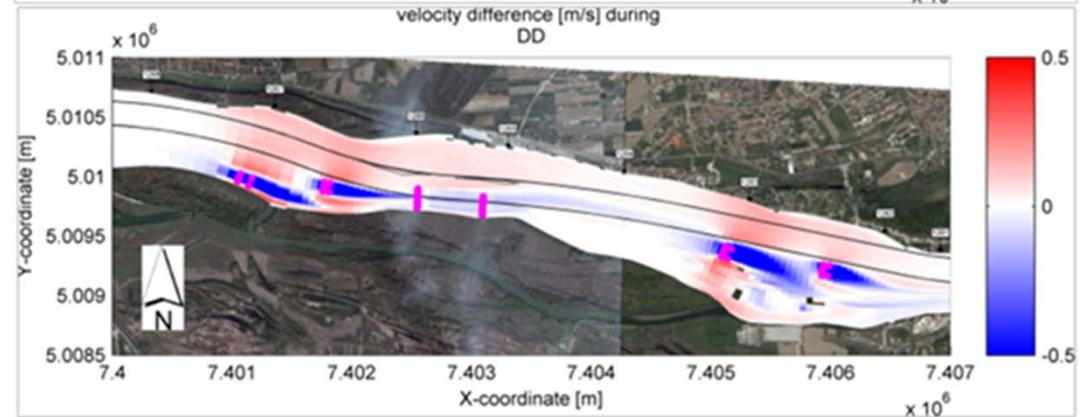
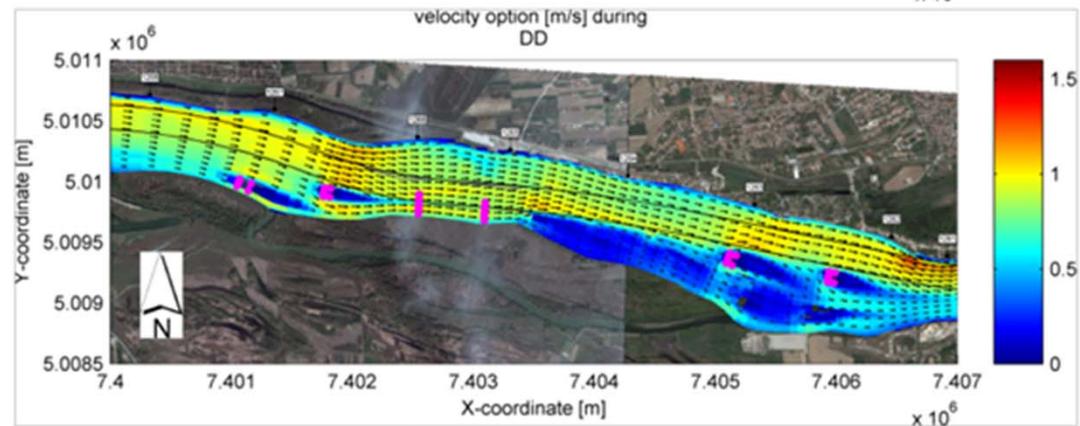
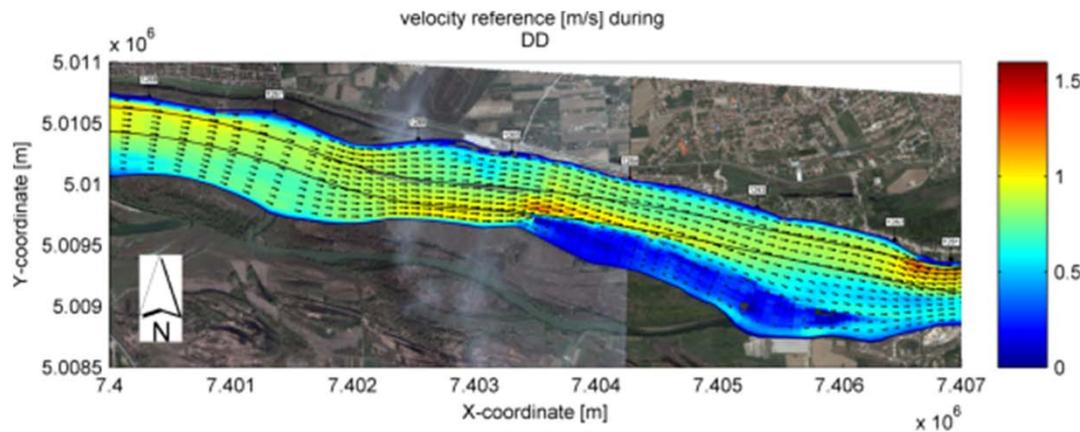
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Residual effect

Critical sector FUTOG –
Flow velocities



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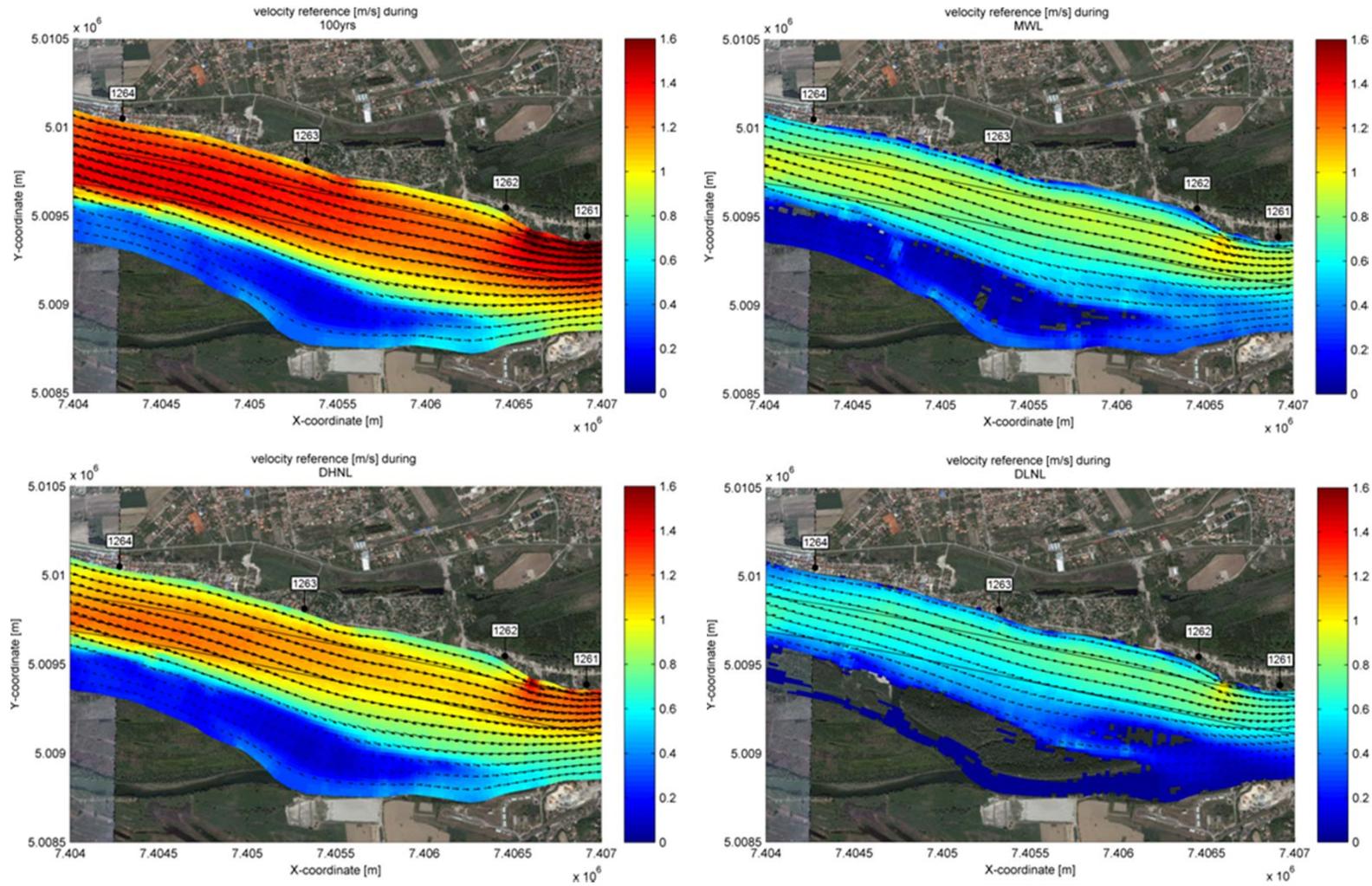
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Critical sector FUTOG – flow fields (current conditions)

Residual effect



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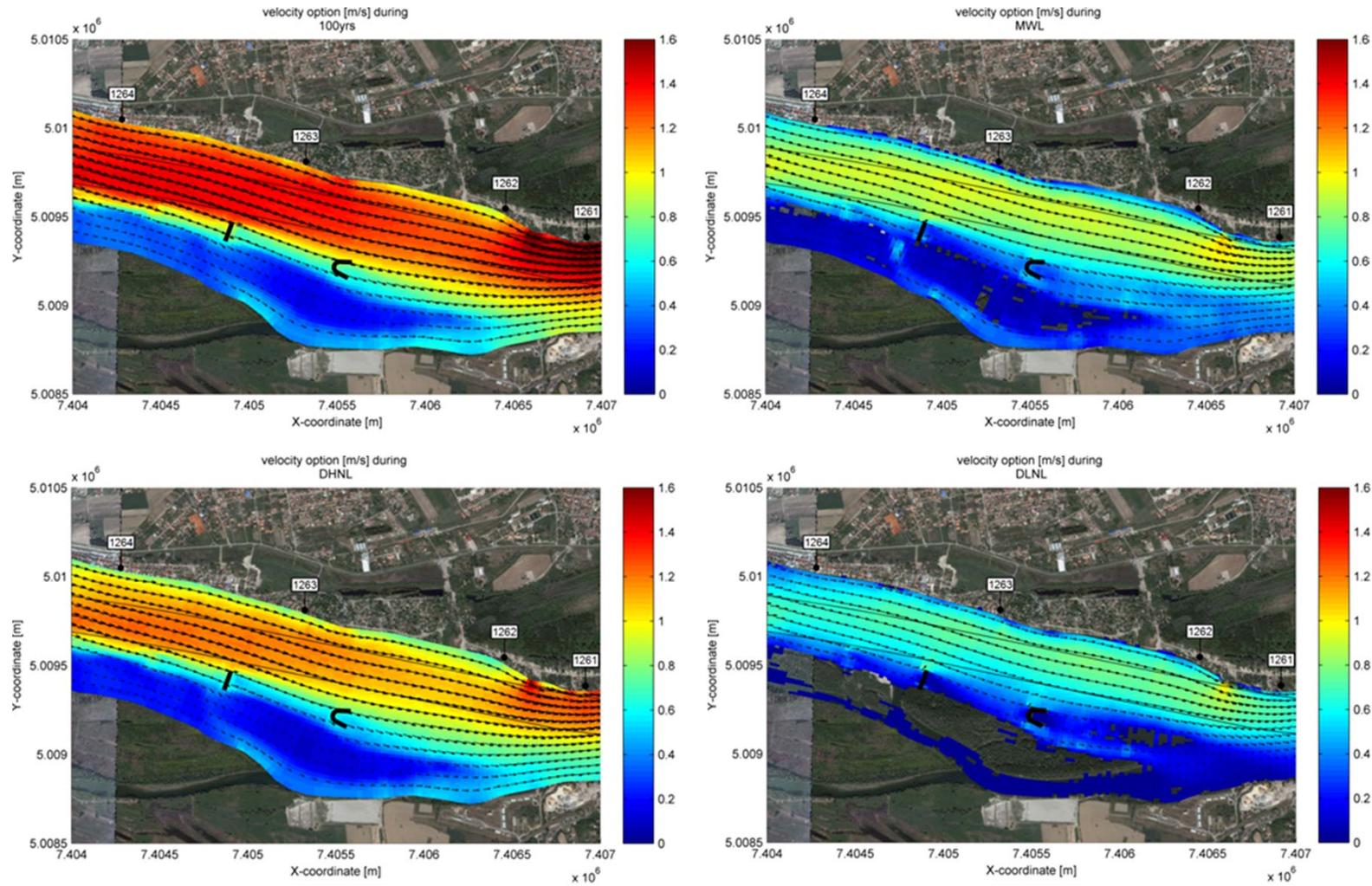
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Critical sector FUTOG – flow fields (alternative option 4)

Residual effect



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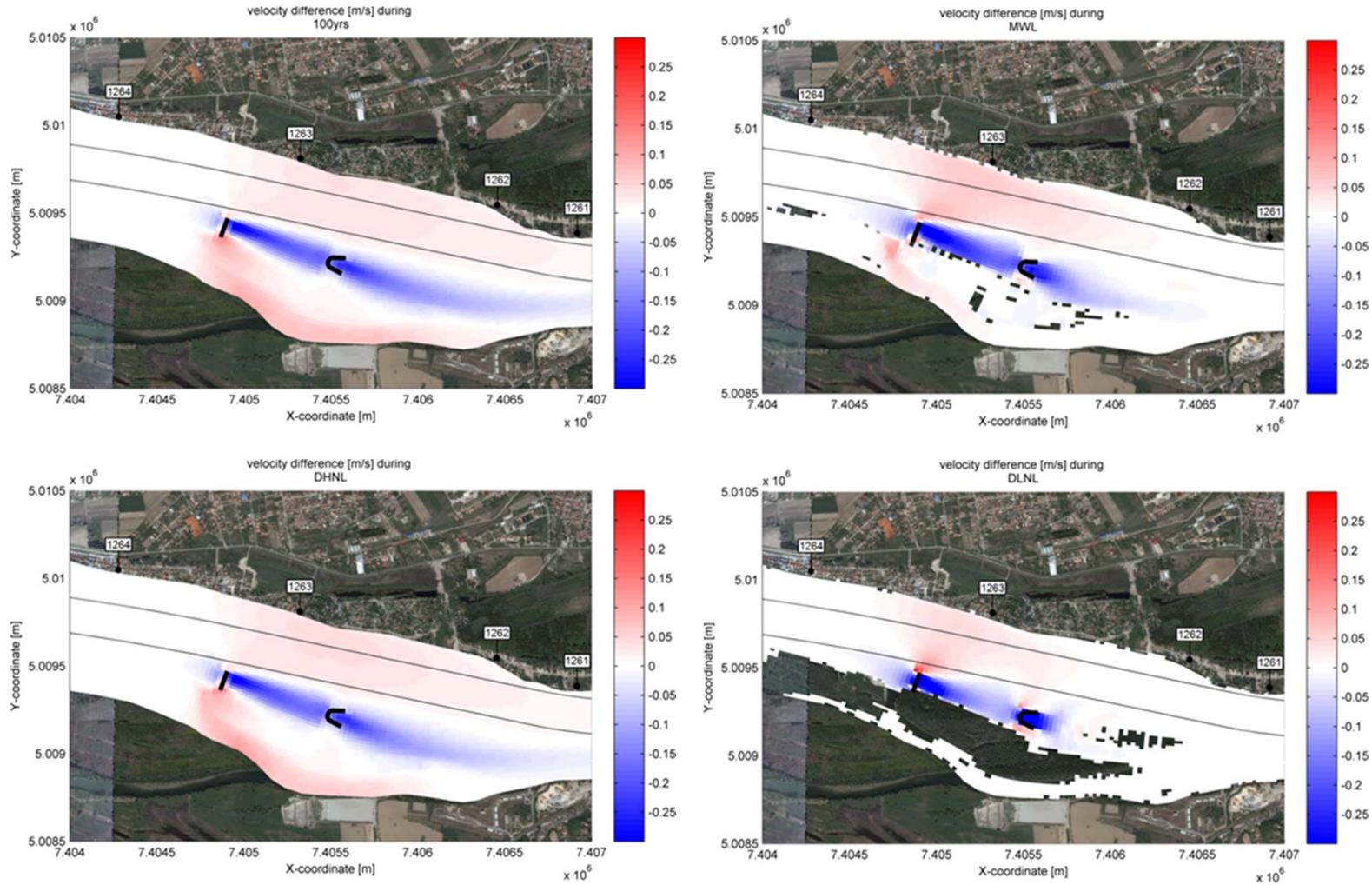
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Critical sector FUTOG – flow fields (difference between current conditions and alternative option 4)

Residual effect



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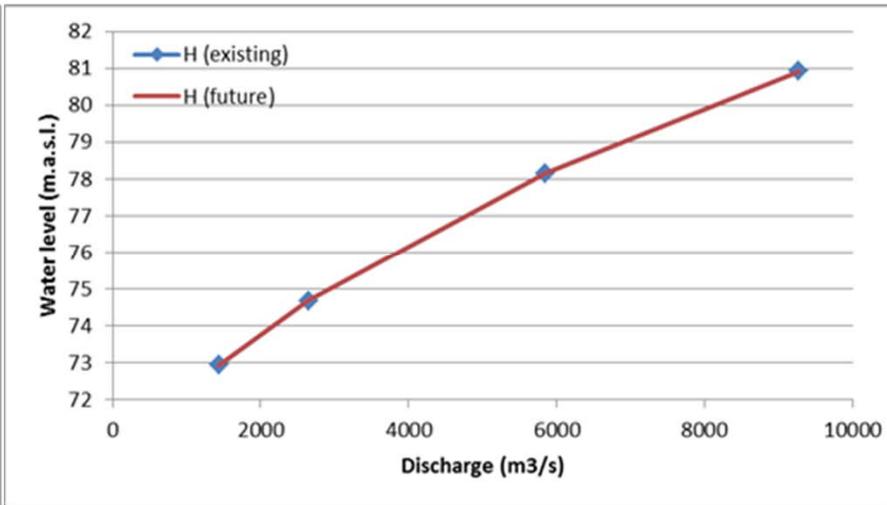
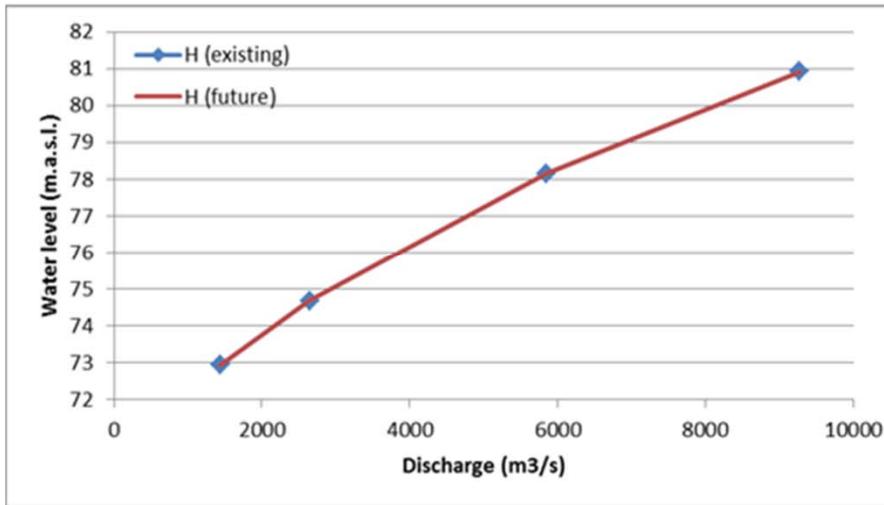
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Critical sector FUTOG – **short term and long term impact on water level changes (km 1.263,8)**

Residual effect



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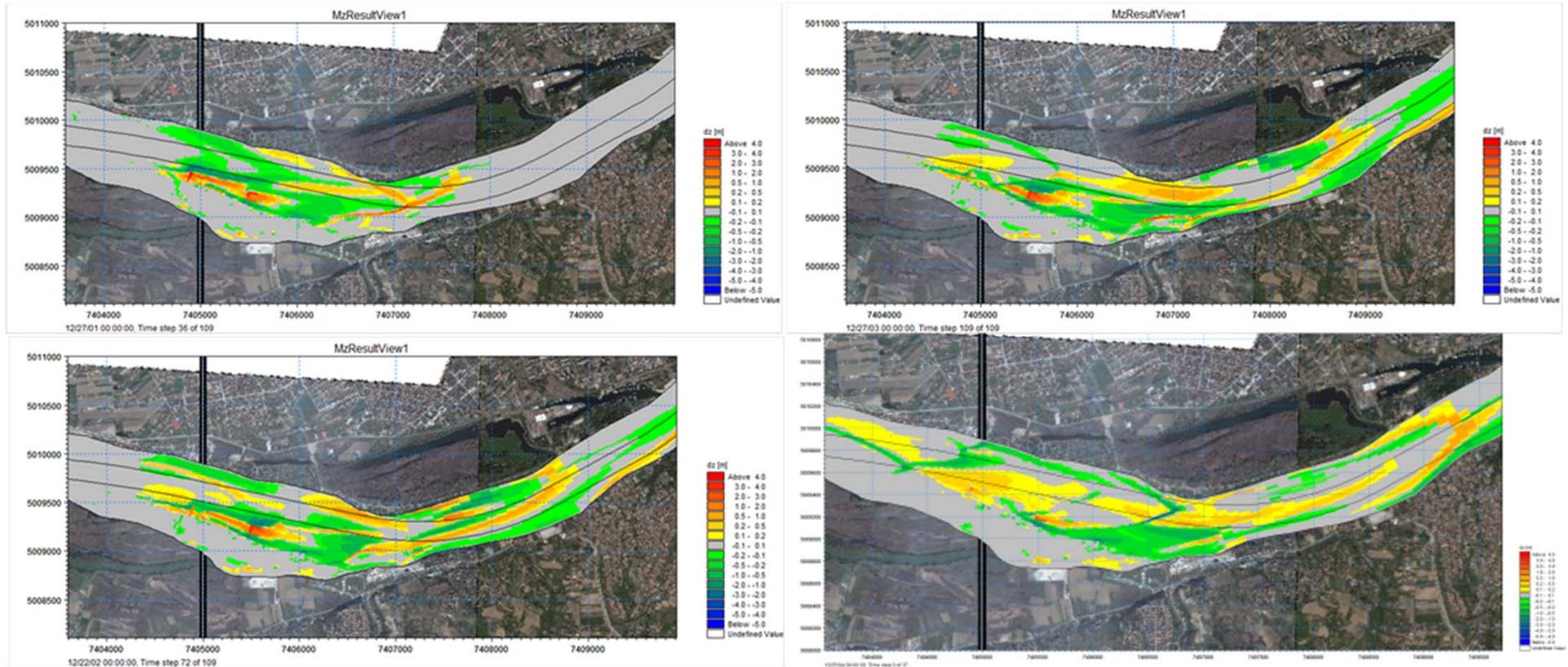
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 DHI

 Plavput 50 YEARS

Critical sector FUTOG – simulated **changes of river bed after construction of structures**

Residual effect



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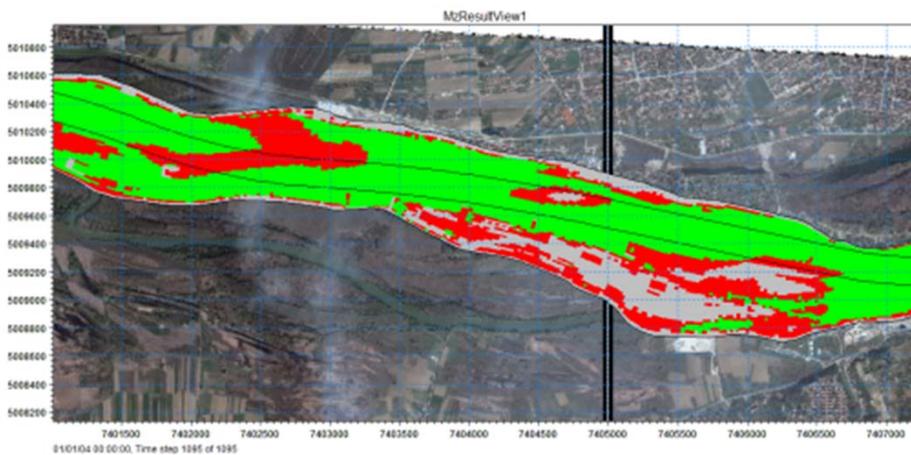
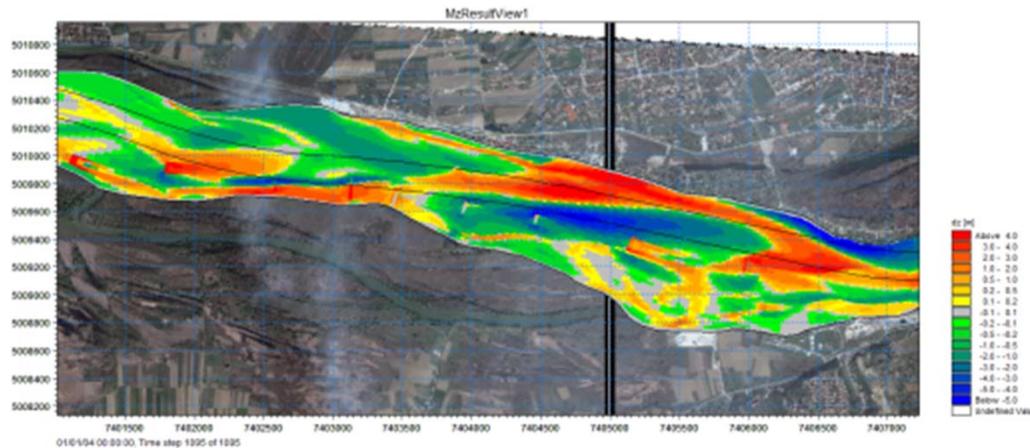
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Residual effect

Critical sector FUTOG – **discarded alternative options due to dramatic residual effects**



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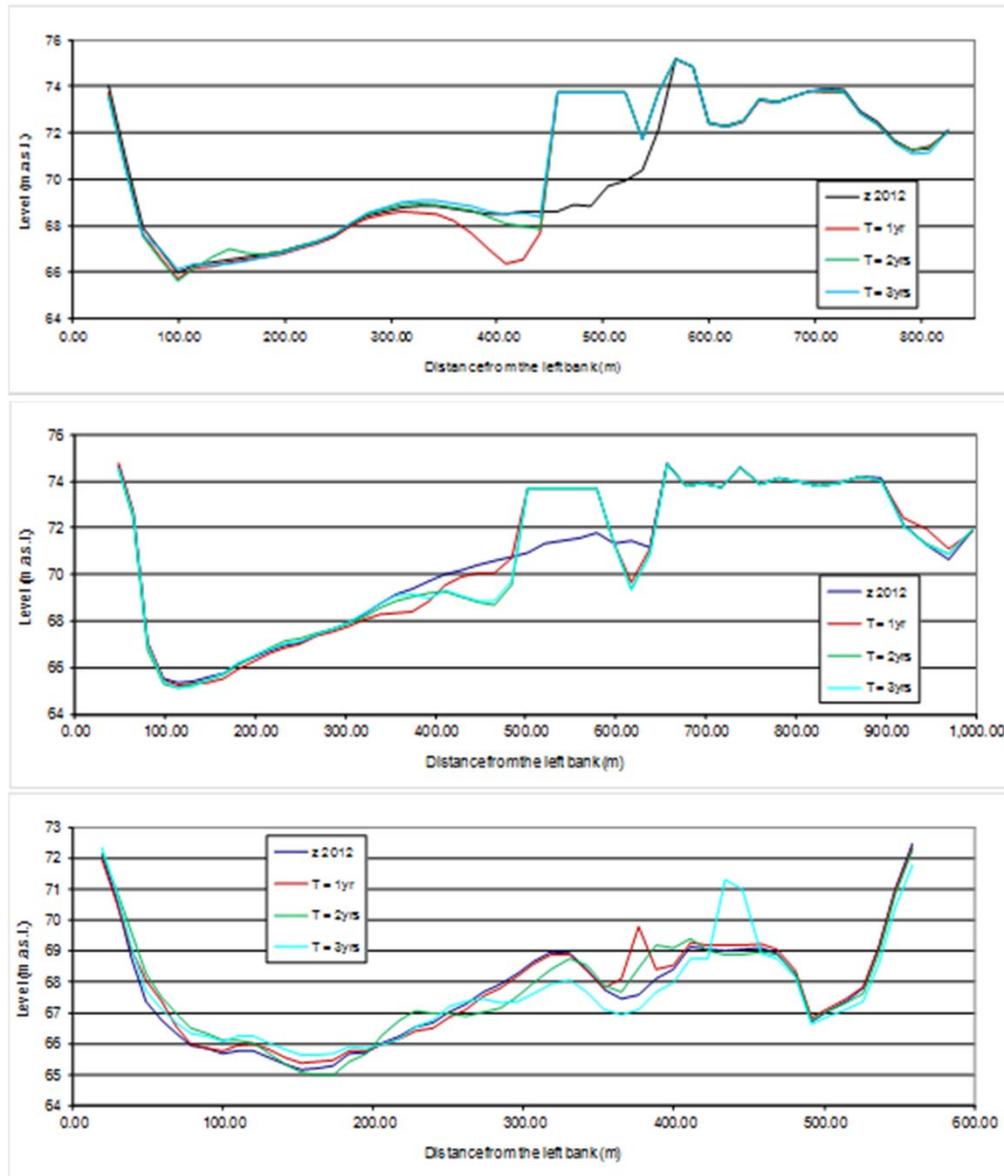
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Residual effect

Critical sector FUTOG –
Alternative solutions – simulated changes of cross-sections 1, 2 and 3 years after construction of structures



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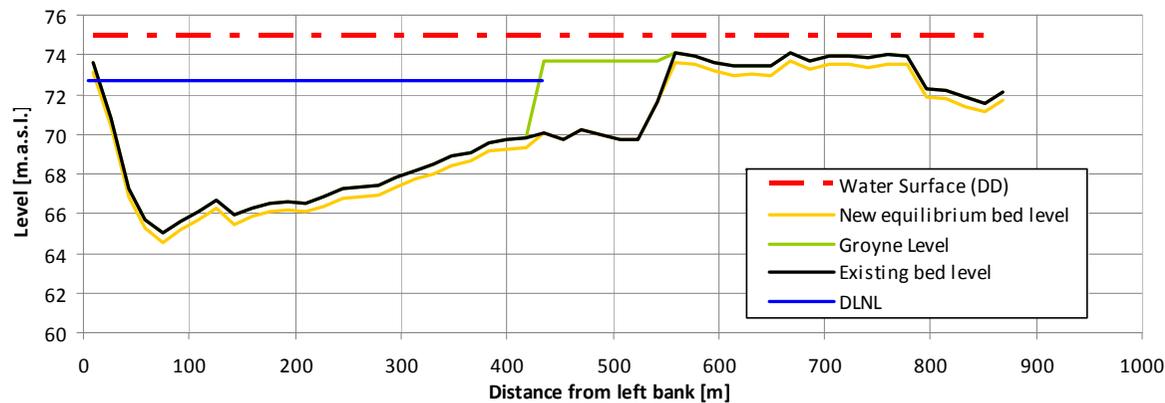
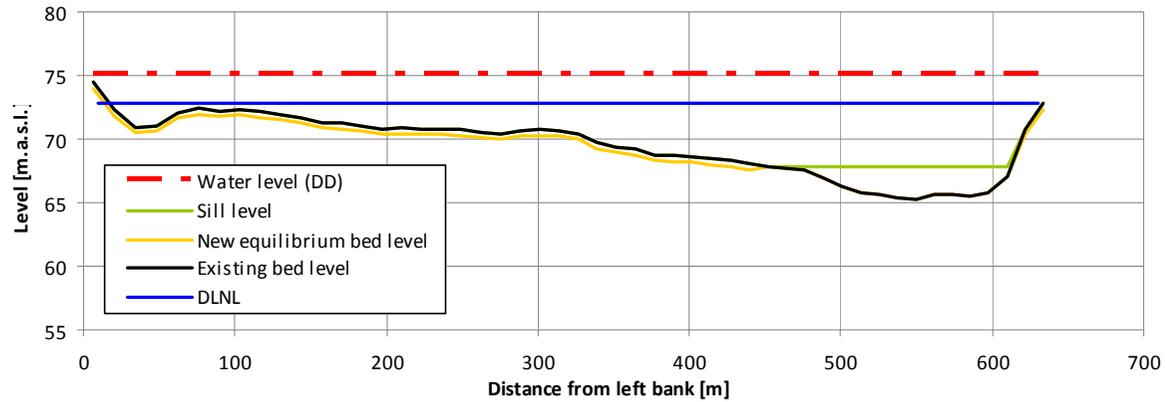
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Residual effect

Critical sector FUTOG FUTOG –
calculated changes of river bed
levels for alternative options



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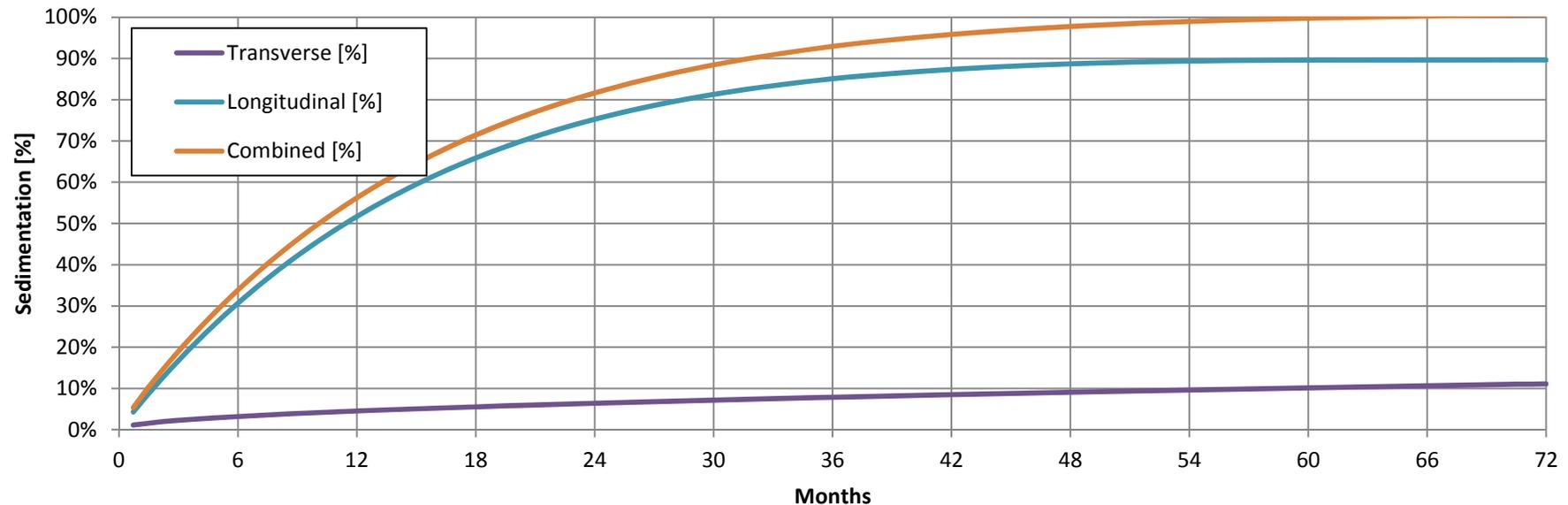
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Residual effect

Critical sector FUTOG –
**alternative options – sediment
backfilling rates after dredging of
the sediment**



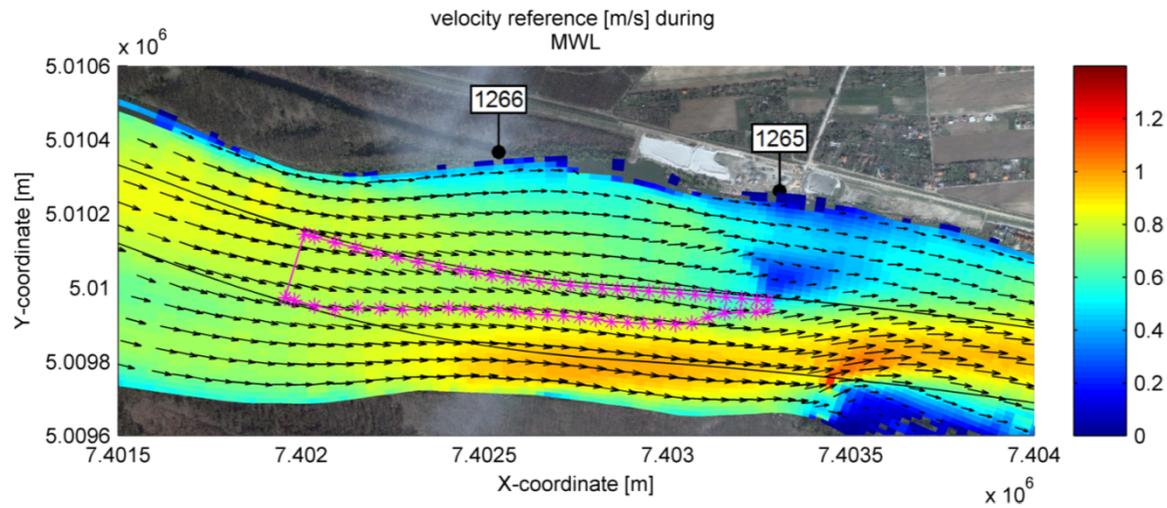
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Residual effect



Critical sector FUTOG –
**alternative options –
flow fields in dredging
areas and sediment
deposition areas**



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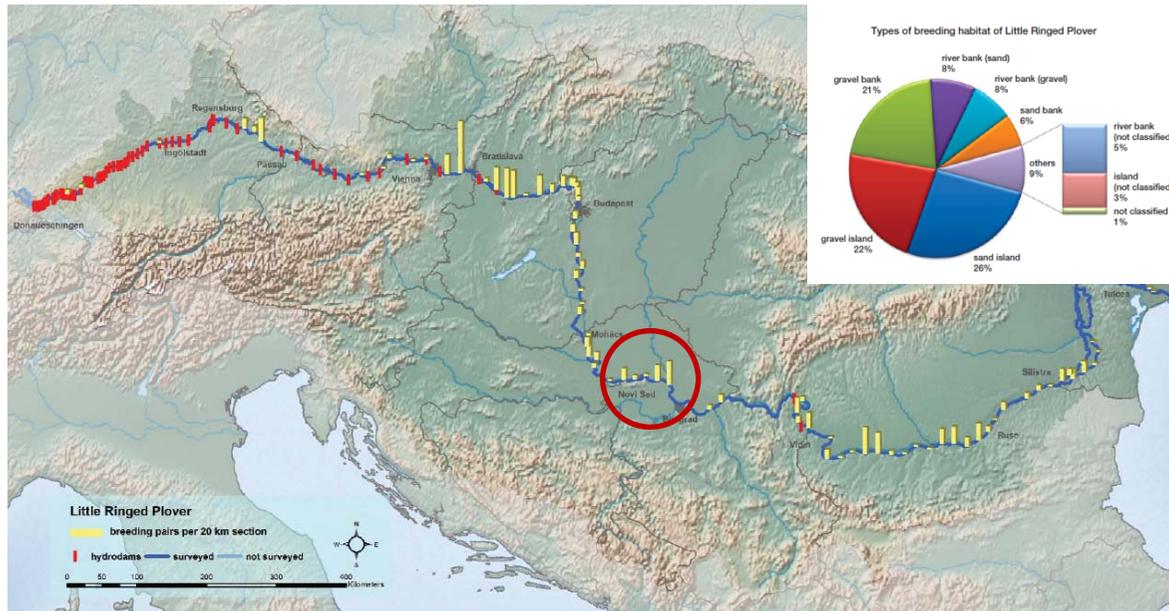
Country / Section	Length (km)	Breeding sites (n)	(n)	Territories (%)	per/km	Mean territories per site (n)
Germany	(658 km)	22	25	6.8	0.04	1.14
Germany-Austria	(29 km)	0	0	0.0	0.00	
Austria	(321 km)	24	45	12.2	0.14	1.88
Austria-Slovakia	(8 km)	0	0	0.0	0.00	
Slovakia	(22 km)	0	0	0.0	0.00	
Slovakia-Hungary	(142 km)	37	62	16.8	0.44	1.68
Hungary	(275 km)	36	48	13.0	0.17	1.33
Serbia-Croatia	(138 km)	10	26	7.0	0.19	2.60
Serbia	(220 km)	15	33	8.9	0.15	2.20
Serbia-Romania	(230 km)	5	17	4.6	0.09	3.40
Bulgaria-Romania	(471 km)	54	88	23.8	0.19	1.63
Romania	(ca. 600 km)*	15	25	6.8	0.04	1.67
Total	> 3100 km	218	369	100	0.12	1.69

Residual effect

Source: Danubeparks, 2011
www.danubeparks.org

Critical sector FUTOG—
**alternative options –
 biology, example of
 indicative species**

TYPICAL LITTLE RINGED PLOVER HABITATS

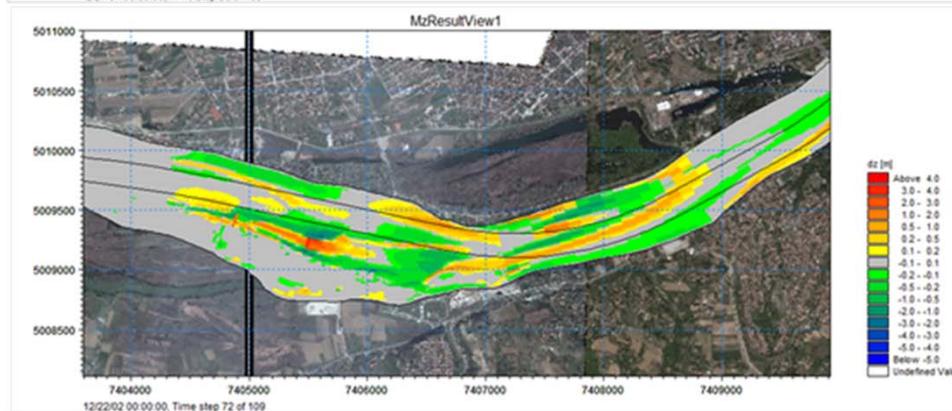
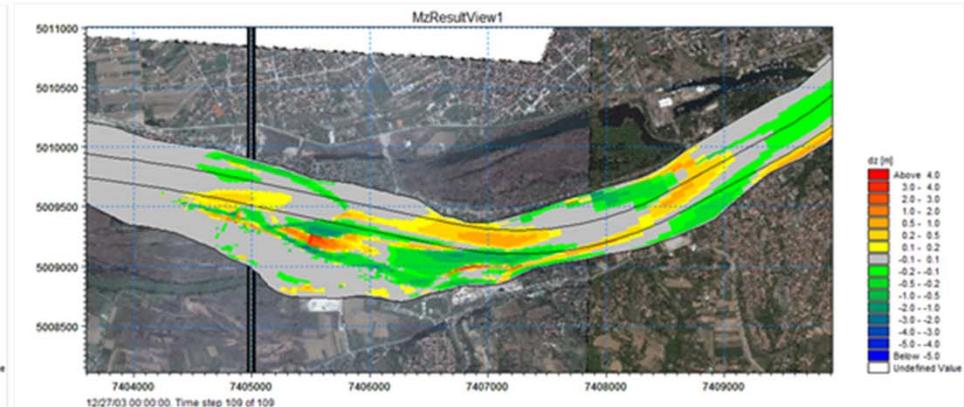
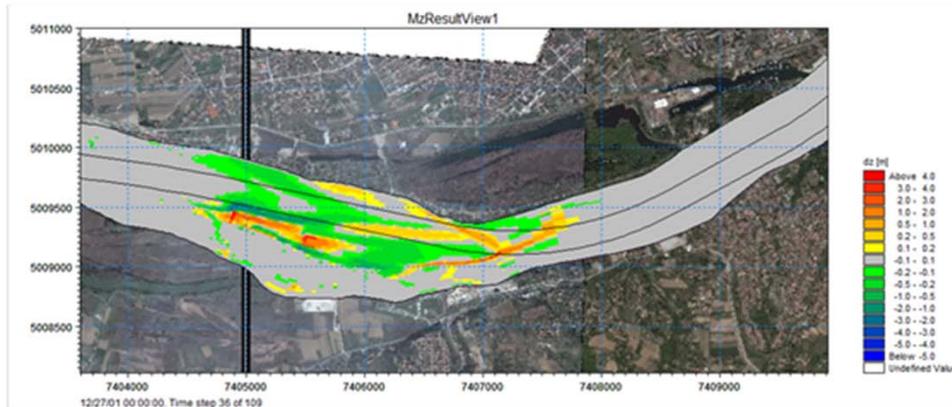


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Critical sector FUTOG – **simulated changes of the river bed after construction of structures; alternative optionsa – biology, example of indicative species**

Residual effect



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Mitigation measures

Critical sector FUTOG – **accepted alternative solution – mitigation measures**

- No works in the period April-July
- Depositing dredged sediment back to the river
- Smanjiti rasipanje nanosa prilikom vraćanja u reku
- Rive shell (Unio Sp.)
- Monitoring of sediment concentration during works
- Application of detached structures which guarantee preserving connectivity of water bodies and formation of temporary sandbars
- Lowering of the crest levels of structures
- Using different stone sizes during construction of structures
- Execution of works from the water



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Mitigation measures

Critical sector FUTOG – **accepted alternative solution – mitigation measures**

- Avoid establishment of temporary objects on the bank
- No maintenance of construction equipment and machines on the site
- Avoid spilling of fuel on sites
- No waste and dangerous materials depositing along the ecological corridor
- In the case of occurrence high water periods, apply additional measures
- Keep the Level of noise and aero pollution below the defined thresholds
- In the case of archaeological and geological discoveries during works, stop works and address relevant authorities



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 DHI

 Plovput 50
YEARS

Multi-criteria analysis

- Impact on **navigation conditions**
- Impact on **environment**
 - River dynamics
 - Sediment quality
 - Floodplains
 - Protected areas
 - Endangered species
- **Technical feasibility**
- **Costs**



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 DHI

 Plyput **50**
YEARS

Multi-criteria analysis

основни критеријум	Стандардни пондер	пондер анализе осетљивости
Ефикасност и безбедност пловидбе	25%	10%
Животна средина	40%	60%
Техничка питања	25%	10%
Трошкови	10%	20%



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Multi-criteria analysis

број	основни критеријум	стандардни пондер критеријума	подкритеријум	пондер подкритеријума
1	Ефикасност и безбедност пловидбе	25%		
1.1			поштовање препорука Дунавске комисије	20%
1.2			видљивост објекта	40%
1.3			утицај на промену правца тока	40%
2	Животна средина	40%		
2.1			рибља популација	20%
2.2			птичја популација	20%
2.3			биљни свет	10%
2.4			квалитет воде	20%
2.5			динамика реке и ниво воде	30%
3	Техничка питања	25%		
3.1			време изградње	10%
3.2			извођење радова (комплексност и безбедност изградње)	10%
3.3			одржавање	40%
3.4			одрживост	40%
4	Трошкови	10%		
4.1			трошкови изградње	30%
4.2			трошкови одржавања	70%



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Multi-criteria analysis

Naziv sektora:		SEKTOR 19 - FUTOG			MODELOVANE OPCIJE								
Br.	Kriterijum	učešće %	Podkriterijum	ponder %	opcija 1		opcija 2 (bagerovanje 2011)		opcija 3		opcija 4		
					rezultat	ocena	rezultat	ocena	rezultat	ocena	rezultat	ocena	
1	Efikasnost i bezbednost plovidbe	25%											
			1.1	poštovanje preporuka Dunavske komisije	20%		-2		2		-2		2
			1.2	vidljivost objekta	40%		0		0		1		1
			1.3	uticaj na promenu pravca toka	40%		-2		1		-2		-1
			Ukupno pondera		100%		-1.200		0.800		-0.800		0.400
			Rangiranje opcije po kriterijumu: EFIKASNOST BEZBEDNOST PLOVIDBE				4		1		3		2
2	Životna sredina	40%											
			2.1	riblja populacija (mrešćenje, migracija, uzgoj, život)	20%		1		-1		1		1
			2.2	ptičja populacija (gnežđenje, prezimljavanje)	20%		1		0		2		1
			2.3	biljni svet (reke i priobalja)	10%		-1		0		-1		0
			2.4	kvalitet vode	20%		0		-2		0		-2
			2.5	rečna dinamika i nivo vode (fizički diverzitet, kanalsanje itd)	30%		1		0		2		1
			Ukupno pondera		100%		0.600		-0.600		1.100		0.300
			Rangiranje opcije po kriterijumu: ŽIVOTNA SREDINE				2		4		1		3
3	Tehnička pitanja	25%											
			3.1	vreme izgradnje	10%		0		2		-1		1
			3.2	komplikovanost izvođenja	10%		-1		2		-2		1
			3.3	održavanje	40%		0		-2		0		1
			3.4	održivost	40%		0		-2		1		0
			Ukupno pondera		100%		-0.100		-1.200		0.100		0.600
			Rangiranje opcije po kriterijumu: TEHNIČKA PITANJA				3		4		2		1
4	Trošak	10%											
			4.1	troškovi izgradnje	30%		1		2		0		2
			4.2	troškovi održavanja	70%		1		-2		0		-1
			Ukupno pondera		100%		1.000		-0.800		0.000		-0.100
			Rangiranje opcije po kriterijumu: TROŠKOVI				1		4		2		3
Ukupno		100%											
			UKUPNO PONDERA				0.015		-0.42		0.265		0.36
			RANGIRANJE OPCIJA				3		4		2		1
			standardni ponderi <u>ponderi analize osetljivosti</u>										
		25%	10%	Efikasnost i bezbednost plovidbe									
		40%	60%	Životna sredina									
		25%	10%	Tehnička pitanja									
		10%	20%	Troškovi									
			RANGIRANJE PREMA ANALIZI OSETLJIVOSTI				0.43		-0.56		0.59		0
							2		4		1		3



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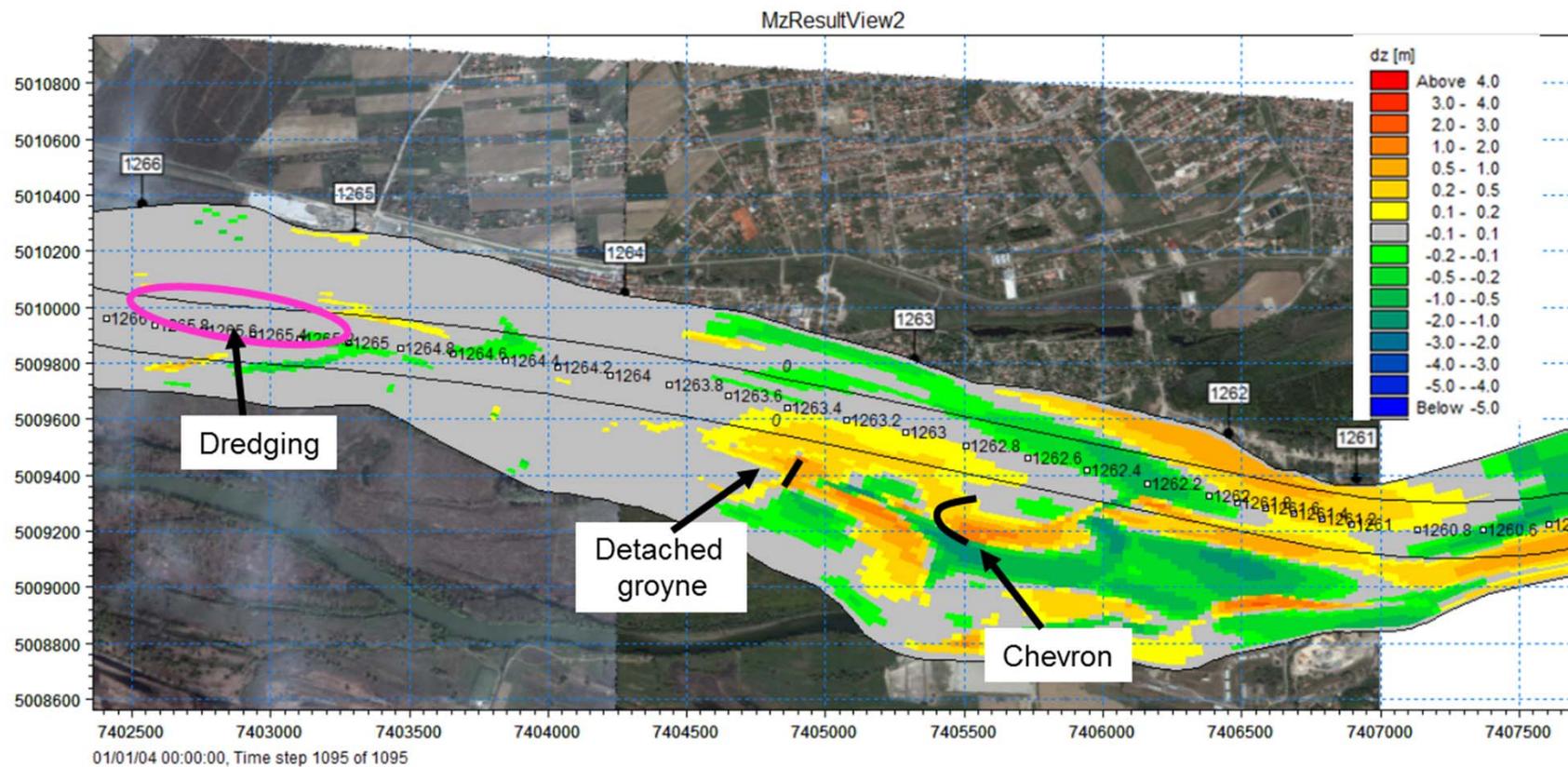


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Multi-criteria analysis

Critical sector FUTOG –
selected alternative option



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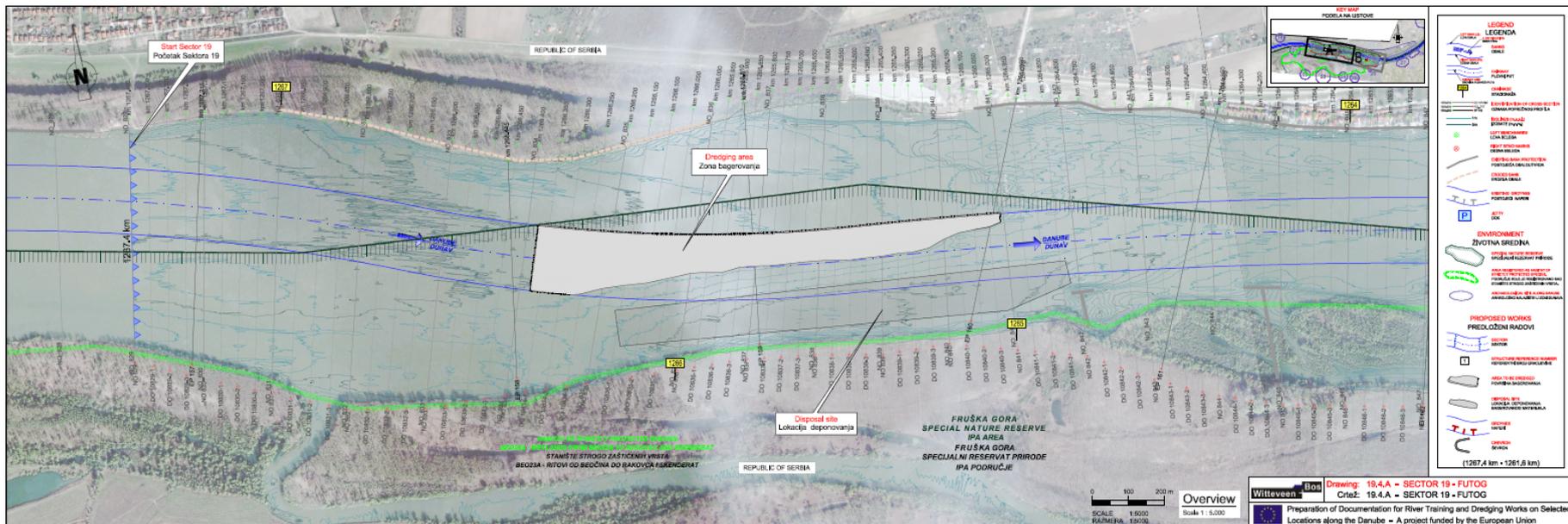
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Multi-criteria analysis

Critical sector FUTOG – selected alternative option



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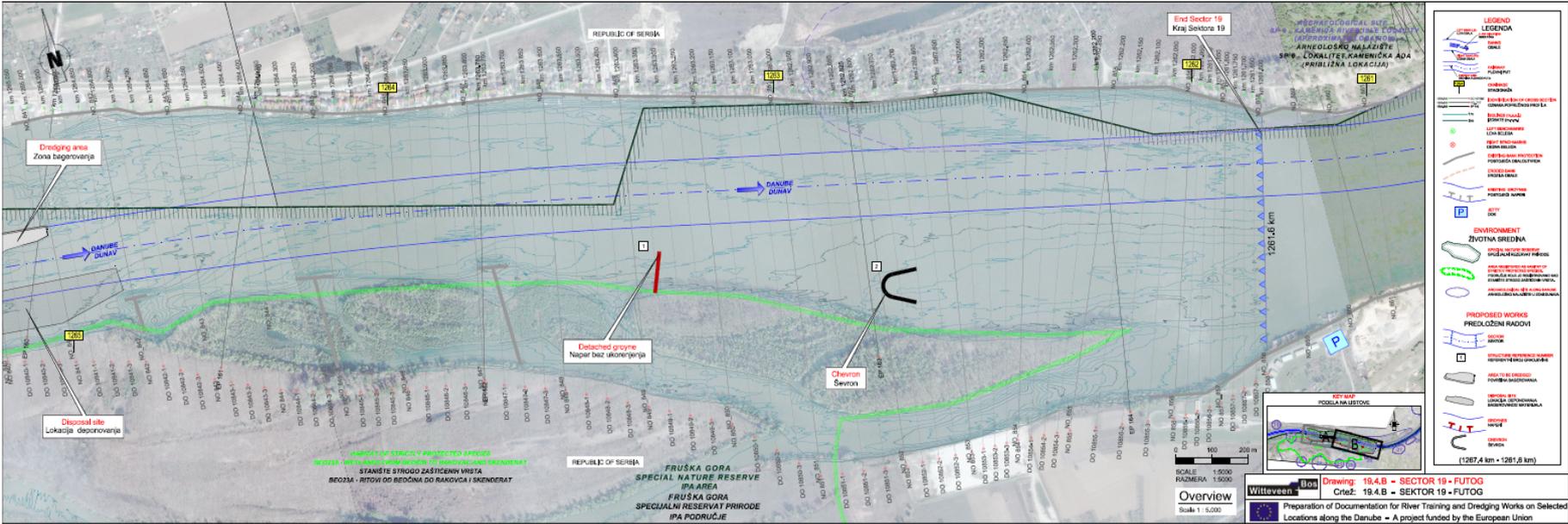
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DHI

Plavput 50 YEARS

Multi-criteria analysis

Critical sector FUTOG –
selected alternative option



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ENERGOPROJEKT

DHI

Plavput 50 YEARS

Multi-criteria analysis

Critical sector FUTOG – selected alternative option

		Пројектоване брзине воде [m/s]			Пројектовани нивои воде [m.a.s.l.]		
		DLNL	DHNL	Q _{1%}	DLNL	DHNL	Q _{1%}
Футог	напер	0.8	1.0	1.2	72.74	77.96	80.60

		\hat{U}_r [m/s]		z_{\max} [m]	H_s [m]
		DLNL	DHNL		
Футог	напер	0.59	0.41	0.95	0.82

		Пројектоване брзине воде [m/s]			Пројектовани нивои воде [m.a.s.l.]		
		DLNL	DHNL	Q _{1%}	DLNL	DHNL	Q _{1%}
Футог	Шеврон	0.6	0.8	1.0	72.71	77.94	80.59

		\hat{U}_r [m/s]		z_{\max} [m]	H_s [m]
		DLNL	DHNL		
Футог	Шеврон	0.71	0.44	0.96	0.79



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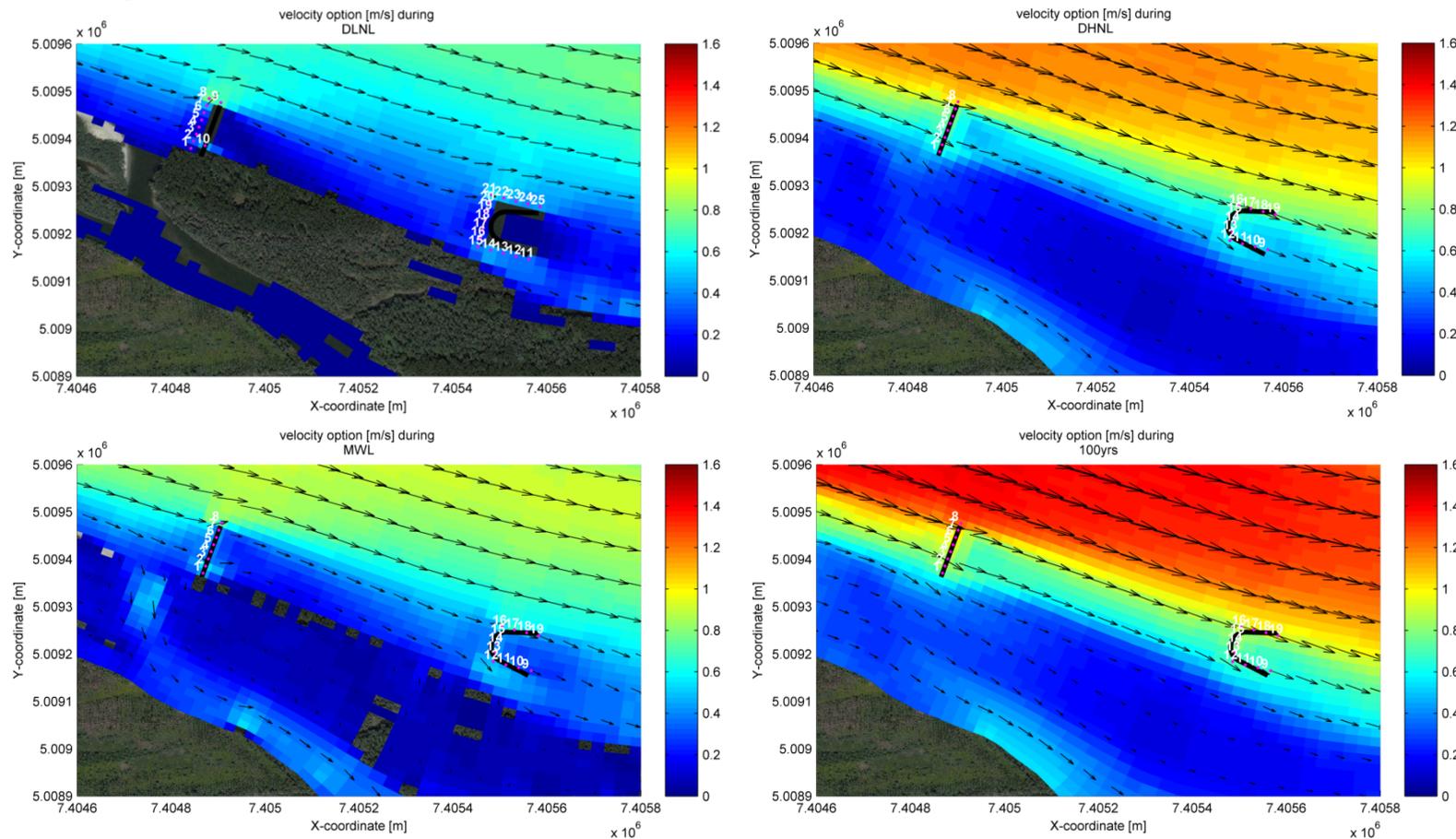


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Multi-criteria analysis

Critical sector FUTOG –
**selected alternative option –
designed flow velocities**



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Multi-criteria analysis



standardni ponder	ponder analize osetljivosti							
25%	10%	Efikasnost i bezbednost plovidbe						
40%	60%	Životna sredina	najveća ocena na sektoru					
25%	10%	Tehnička pitanja						
10%	20%	Troškovi						
SEKTORI	opcije						odabrana opcija	radovi u odabranoj opciji
SEKTOR 18 - SUSEK		opcija 2	opcija 3	opcija 4	opcija 5		opcija 5	bagerovanje
standardni ponder		-0.48	-0.56	-0.87	-0.43			
ponderi analize osetljivosti		-0.54	-0.62	-0.92	-0.52			
SEKTOR 19 - FUTOG	opcija 1	opcija 2	opcija 3	opcija 4			opcija 4	bagerovanje naper ševron
standardni ponder	0.015	-0.42	0.265	0.36				
ponderi analize osetljivosti	0.43	-0.56	0.59	0.26				
SEKTOR 20 - NOVI SAD								nema radova
SEKTOR 21 - ARANKINA ADA	opcija 1	opcija 2	opcija 3				opcija 2	bagerovanje
standardni ponder	-0.485	-0.41	-0.725					
ponderi analize osetljivosti	-0.27	-0.38	-0.73					
SEKTOR 22 - ČORTANOVCI	opcija 1	opcija 2		opcija 4	opcija 5		opcija 5	bagerovanje 3 praga
standardni ponder	-0.515	-0.43		-0.335	-0.075			
ponderi analize osetljivosti	-0.57	-0.3		-0.47	-0.03			
SEKTOR 23 - BEŠKA		opcija 2	opcija 3	opcija 4	opcija 5	opcija 6	opcija 6	bagerovanje
standardni ponder		-0.68	-0.58	-0.605	-0.675	-0.48		
ponderi analize osetljivosti		-0.74	-0.22	-0.39	-0.49	-0.66		
SEKTOR 24 - PRELIV		opcija 2	opcija 3	opcija 4	opcija 5		opcija 5	2 ševrona
standardni ponder		-0.24	0.91	0.655	0.945			
ponderi analize osetljivosti		-0.4	1.2	0.83	1.13			



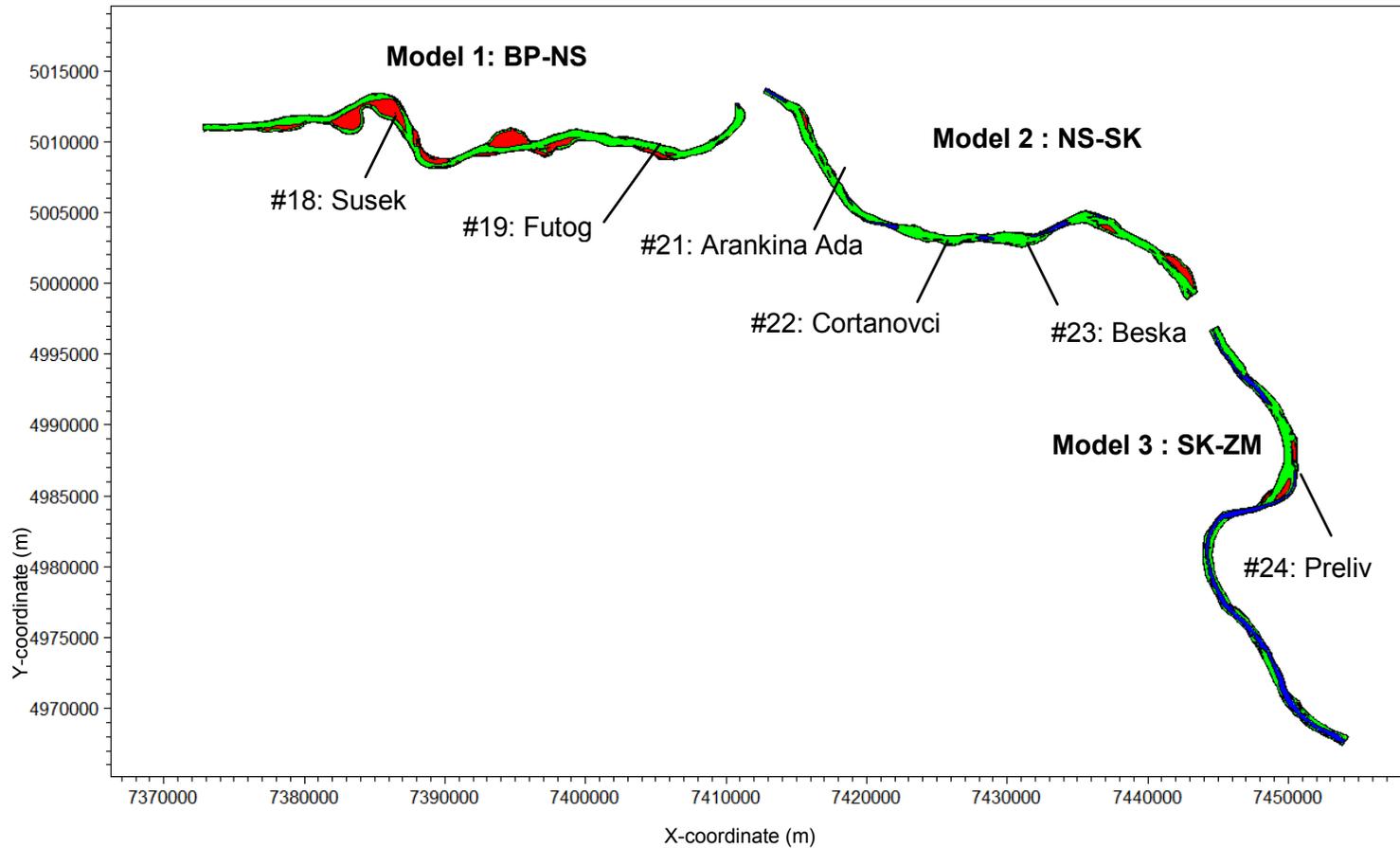
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Analysis of cumulative hydro-morphological effects



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Monitoring programme

- Environmental monitoring ensured:
 - Before works
 - During works
 - After works



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Monitoring programme

- Monitoring components:
 - **Hydro-morphology** – changes of river bed, flow velocities, water levels, sediment transport regime, river dynamics
 - Comparison of real and modeled effects
 - **Water and sediment quality**
 - **Biology** – population of indicative fauna and flora
 - Birds
 - Fish
 - Plants
 - *Macrozoobenthos*
 - Identification of needs for **compensation measures**



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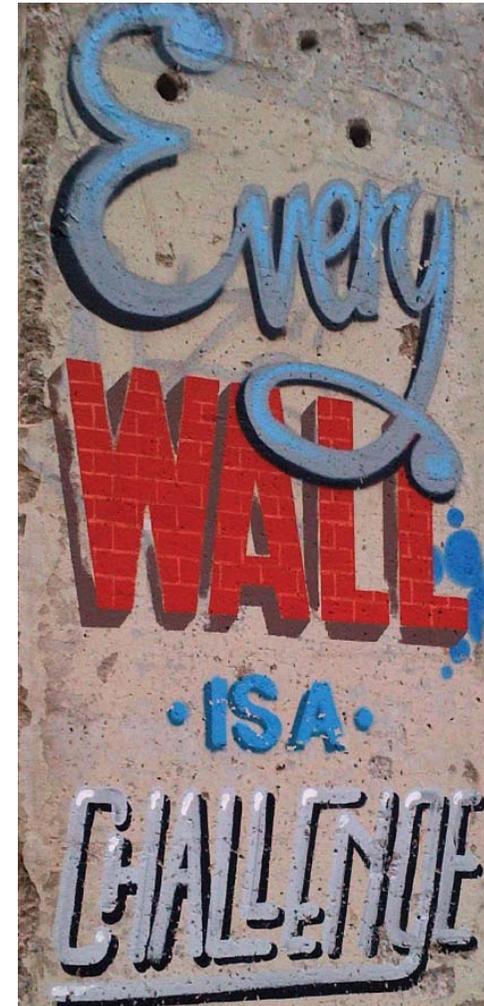
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Planning process transparency and public participation

- Facts:
 - **9** Stakeholders' Forum meetings
 - **2** fields trips to critical sectors for stakeholders
 - **16** presentations on different international and domestic conferences
 - **24** published articles on project
 - **1** movie on project
 - **2.000** hits monthly on the Stakeholders' Forum web site



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Planning process transparency and public participation

Part of Plovput's web site on Stakeholders' Forum:

Република Србија
Министарство саобраћаја
ДИРЕКЦИЈА ЗА ВОДНЕ ПУТЕВЕ

Претрага (кирилично)

Насловна >>> Форум заинтересованих страна / Forum of Stakeholders

Документа
Информатор
Јавне набавке
Фото галерија
Newsletter

Forum
Zainteresovanih strana

NEWADA duo
co-wanda
Програм опремања
Equipment Programme
NEWADA duo
ИСТРАЖИВАЊЕ

Српски	English
Општа правила организације и рада Форума	General rules on organization and work of the Forum
Флајер пројекта	Project flyer
Чланци	Articles
Analiza morfoloških promena reke Dunav uzvodno od ušća reke Save	

www.plovput.rs



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Planning process transparency and public participation

- Part of Plovput's web site on Stakeholders' Forum
 - All documentation available in Serbian and English language
 - Free access to the Stakeholders' Forum web site for everybody, with no limitations



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Planning process transparency and public participation

- Part of Plovput's web site on Stakeholders' Forum
 - Content:
 - General rules on organization and work of the Forum
 - Documentation for the Stakeholders' Forum meetings (agendas, Lists of participants, Meeting minutes, presentations and video materials from meetings)
 - Published articles
 - Presentations from conferences
 - Flyer and movie on the Forum
 - EIA Study



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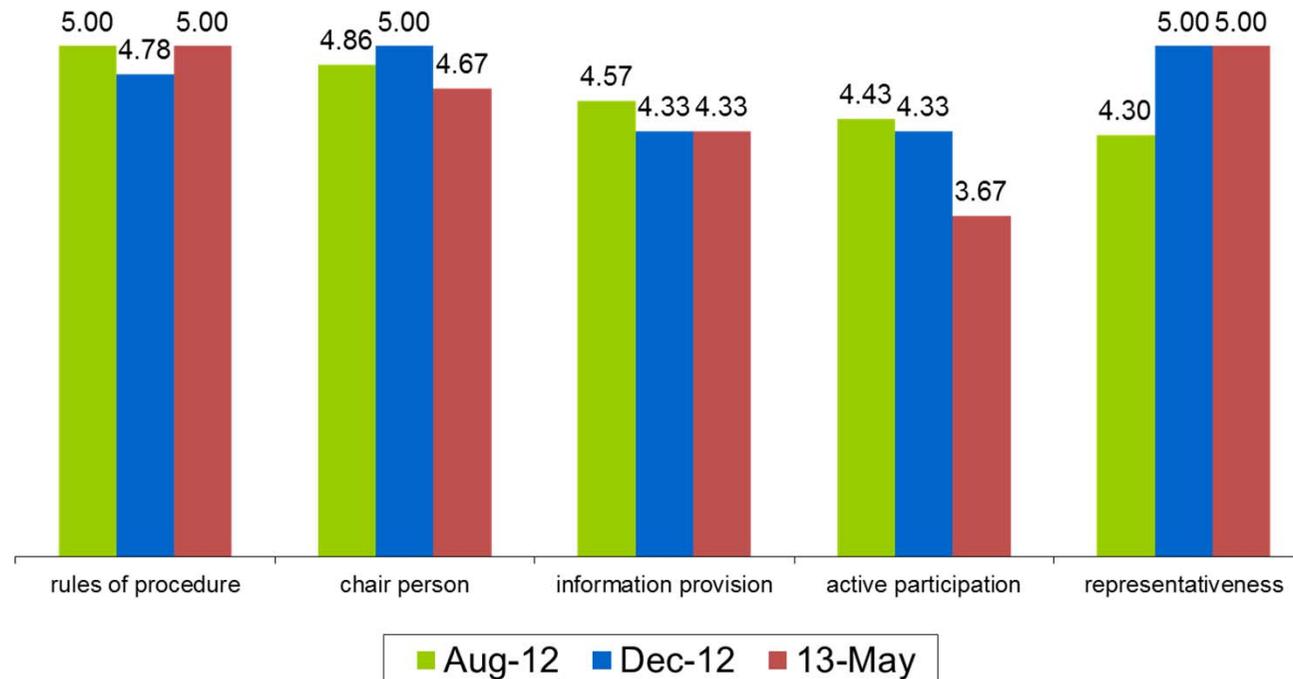
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Planning process transparency and public participation

Evaluation of the work of the Stakeholders' Forum



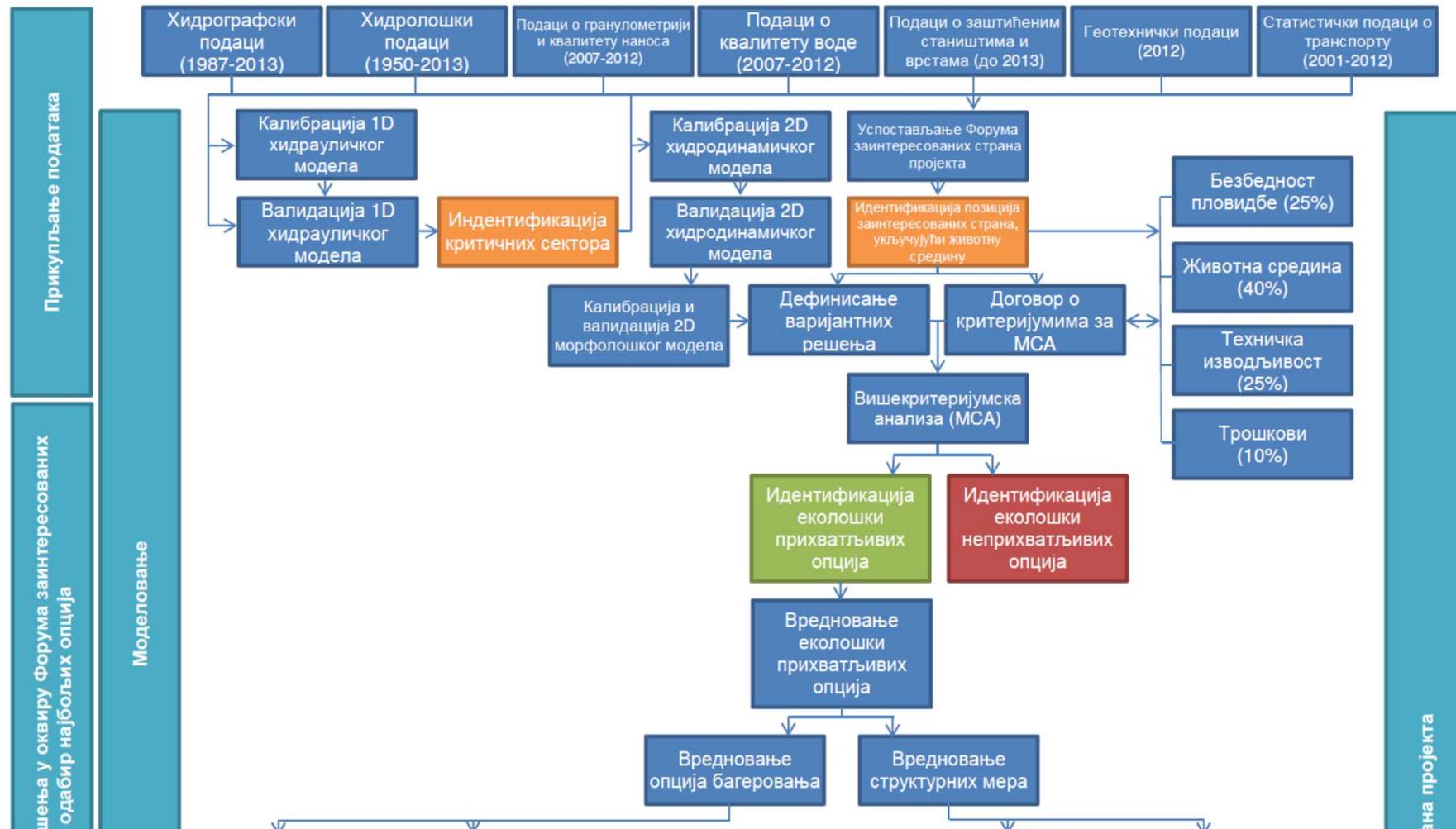
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Planning process



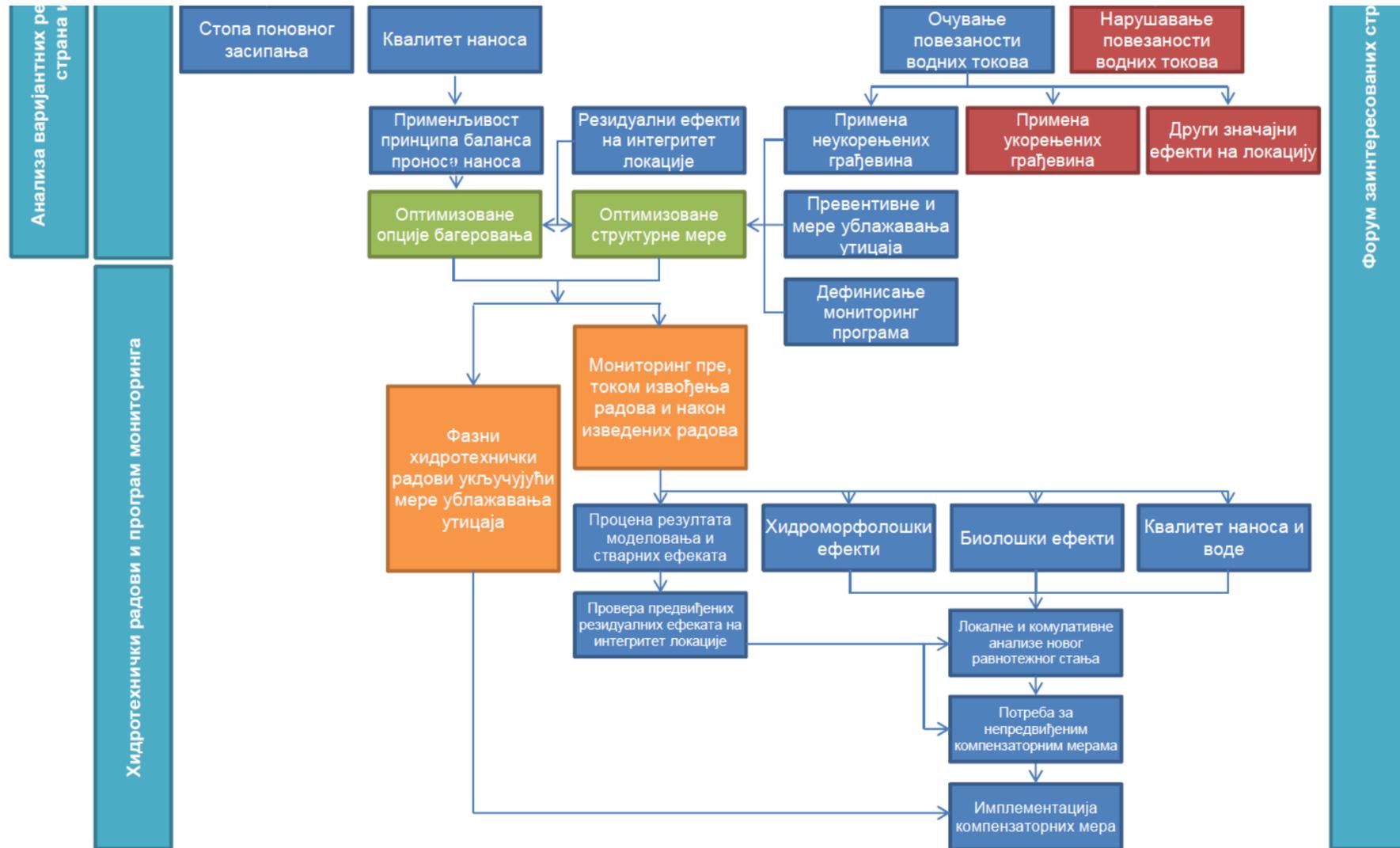
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Planning process



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Summary

Basic data and project range

Strategic and legal framework

Prefeasibility and feasibility opinions and conditions

Definition of critical sector and current navigation conditions

Basic design approach

Current status of environment

Alternative options and residual effects

Mitigation measures

Multi-criteria analysis

Analysis of cumulative hydro-morphological effects

Monitoring programme

Transparency in planning process and public participation

Recap of planning process



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“Preparation of necessary documentation for river raising and dredging works on critical sectors on the Danube River in Serbia”

**Thank you
for your kind attention**

Ivan Mitrovic
Project manager, Directorate for Inland Waterways



Project funded by
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Public hearing
Belgrade, 03-10-2013