



Programme co-funded by the  
EUROPEAN UNION

# **Supervision and Environmental Monitoring of River Training and Dredging Works on Critical Sectors on the Danube River**

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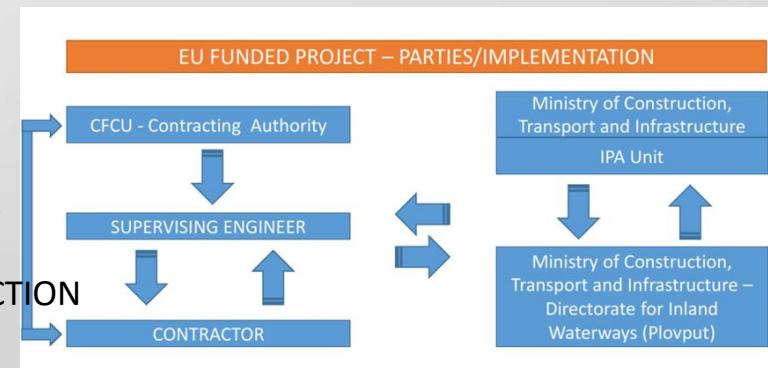
STAKEHOLDERS' FORUM – 23<sup>th</sup> March 2018

Republic of Serbia  
Ministry of Construction,  
Transport and Infrastructure



# Implementation Framework

- Beneficiary Country**
  - Republic of Serbia
- Contracting Authority**
  - Government of the Republic of Serbia. Ministry of Finance. Department for Contracting and Financing of EU Funded Programmes (CFCU)
- Final Beneficiary**
  - Government of the Republic of Serbia. Ministry of Construction, Transport and Infrastructure (MCTI). Department of Strategic Planning and Management of Infrastructure Projects
- End Recipient Institution**
  - Government of the Republic of Serbia. Ministry of Construction, Transport and Infrastructure (MCTI). Directorate for Inland Waterways
- Funding for this project**
  - European Commission – National Programme for Serbia under Instrument for Pre-Accession Assistance (IPA), Transition Assistance and Institution Building Component for the year 2013
- S&EM Consultancy Services**
  - ACCIONA INGENIERIA (SPAIN)
- Works Contractor**
  - AGROMAH LTD (BULGARIA) in consortium with
    - WATER MANAGEMENT BUSSINESS COMPANY REGULACIJE, LIMITED LIABILITY COMPANY, (REPUBLIC OF SERBIA) and
    - COMPANY FOR THE DESIGN ENGINEERING AND CONSTRUCTION KOLUBARA DOO (REPUBLIC OF SERBIA)



# Introduction

## **OBJECTIVE**

The overall objective of this project is the improvement of navigation conditions on the Danube River in accordance with the national policy and strategy provisions and with the respect to the Danube Commission Recommendations and the EU transport system development plans in order to ensure fast, safe, reliable and environmentally friendly transportation, smooth flow of freight and mobility of people.



# The Project

## THE PROJECT

The Project includes:

- ✓ dredging in six selected critical sectors, and
- ✓ construction of several training structures in some of those sectors

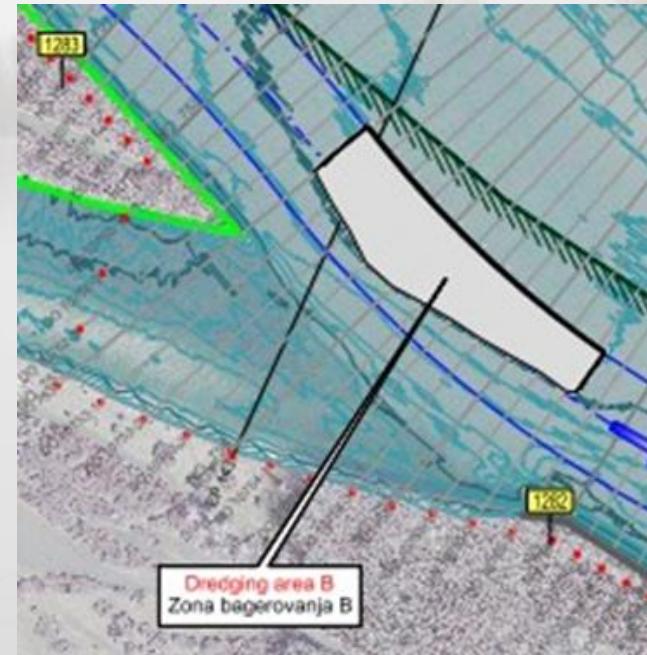
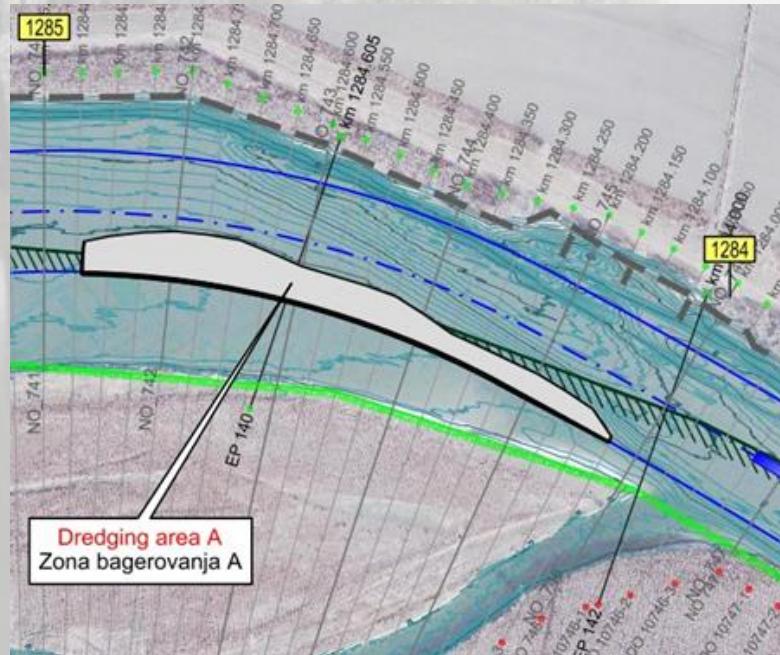


Nº	Name of critical sector	Type of works	Chainage from	to
18	Susek	Dredging A	1285+000	1283+950
		Dredging B	1282+650	1282+050
19	Futog	Dredging	1266+400	1265+000
		Detached groyne	1263+350	
		Chrevon	1262+700	
21	Arankina Ada	Dredging	1246+600	1245+300
22	Čortanovci	Dredging	1240+300	1239+350
		Sill nº 1	1237+700	
		Sill nº 2	1237+150	
		Sill nº 3a	1236+150	
		Sill nº 3b	1236+000	
23	Beška	Dredging	1229+600	1227+400
24	Preliv	Chrevon nº 1	1200+600	
		Chrevon nº 2	1199+800	

## Sector 18 - Susek

Works planned:

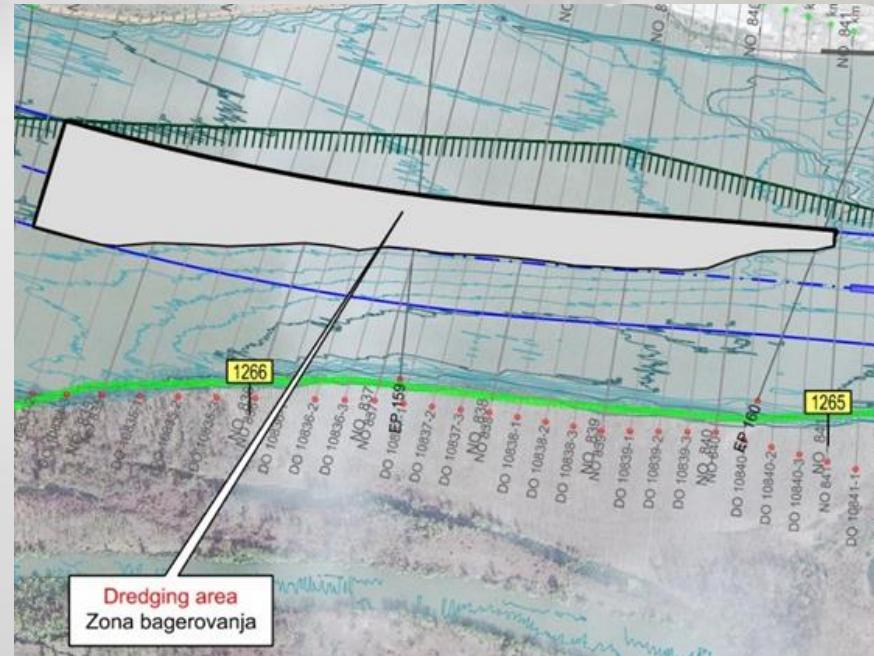
- ✓ Dredging activities



# **Sector 19 - Futog**

## Works planned:

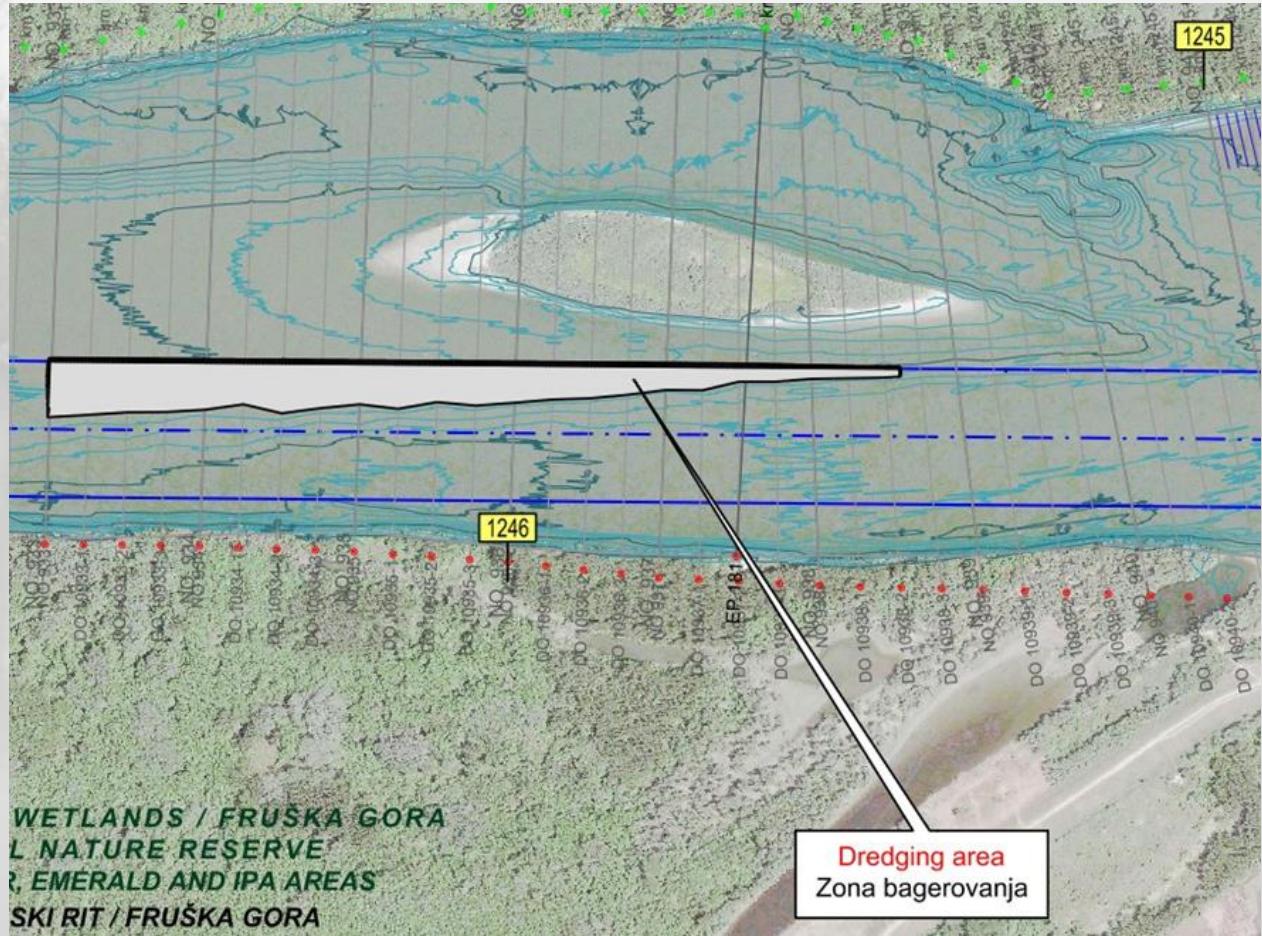
- ✓ Detached groyne
  - ✓ Chevron
  - ✓ Dredging activities



## Sector 21 – Arankina Ada

Works planned:

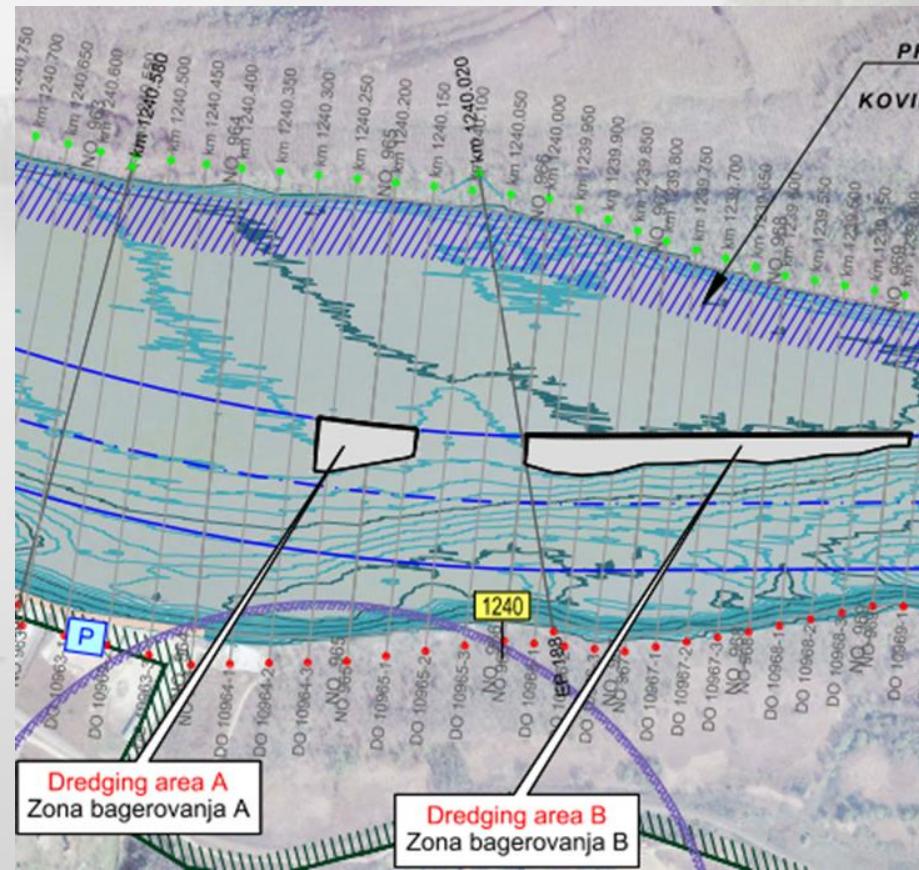
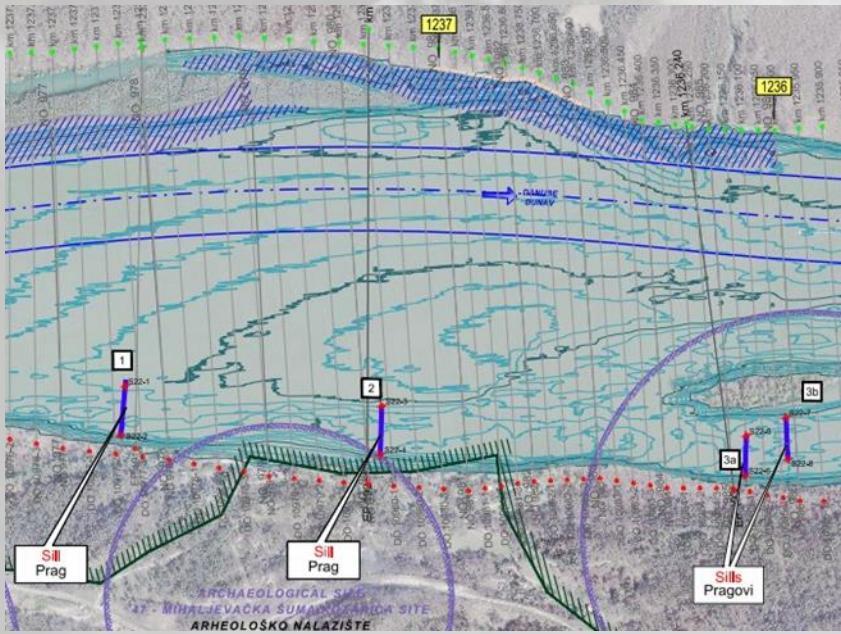
- ✓ Dredging activities



## Sector 22 – Čortanovci

Works planned:

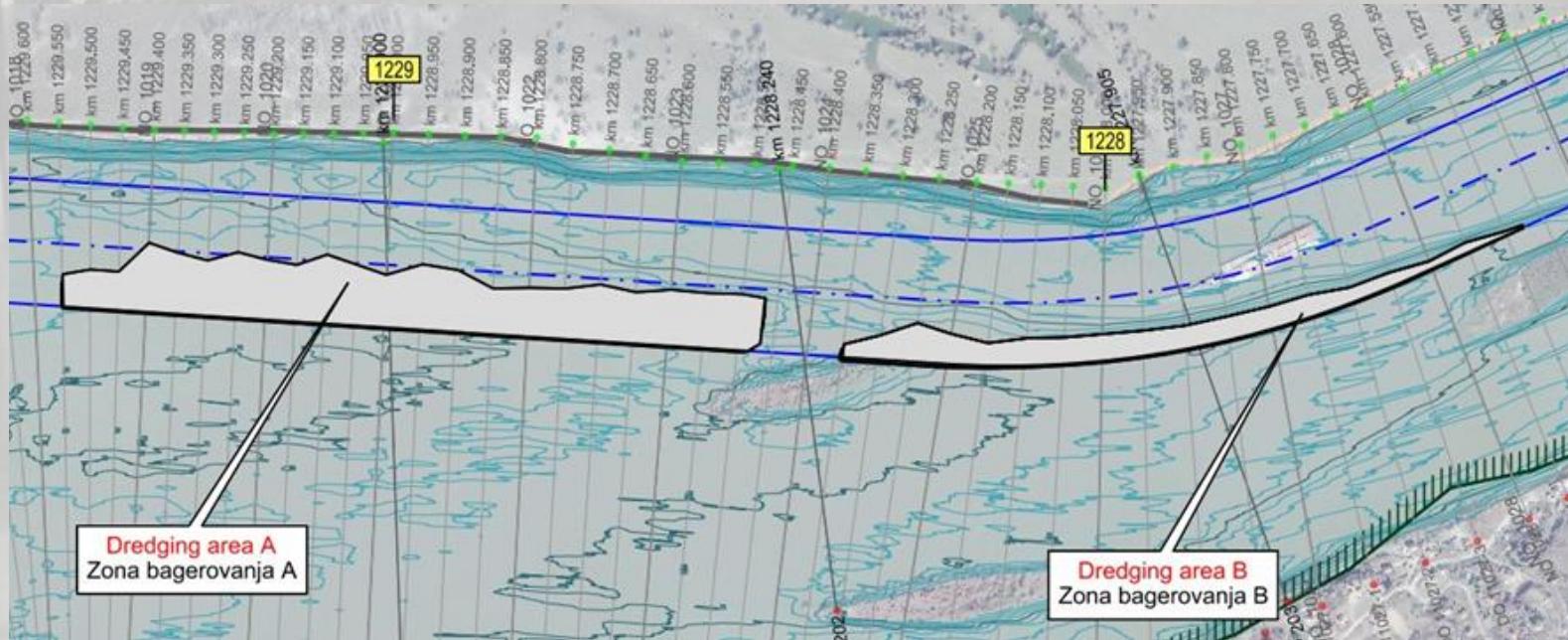
- ✓ 2 sills
- ✓ 1 sill with the opening
- ✓ Dredging activities



## Sector 23 – Beška

Works planned:

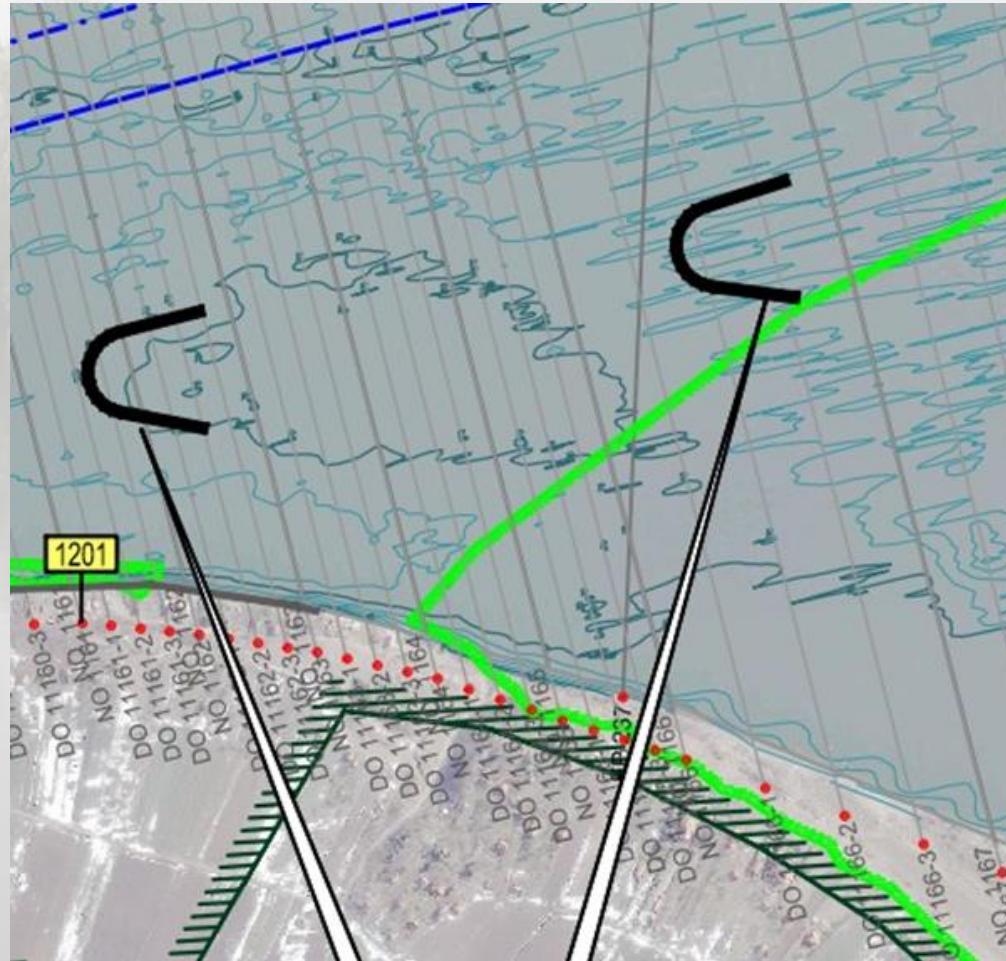
- ✓ Dredging activities



## Sector 24 – Preliv

Works planned:

- ✓ Two chevrons



### Main parameters analyzed

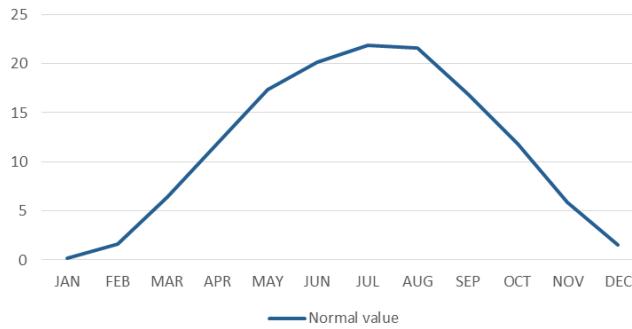
Environmental monitoring has been developed before the commencement of the Works (dredging and training works), covering the six critical sectors and extending for some parameters to Bačka Palanka (km 1295) and Zemun (km 1270).

- Hydromorphology
- Sediment and water quality
- Biology
  - Macrozoobenthos,
  - Vegetation (*Limosella aquatica*)
  - Birds (*Charadrius dubius* and *Riparia riparia*)
  - Fish (*Acipenser ruthenus*)
- Protected Areas
- Archaeology and cultural heritage

Species of interest were detected during the elaboration of the EIA Study

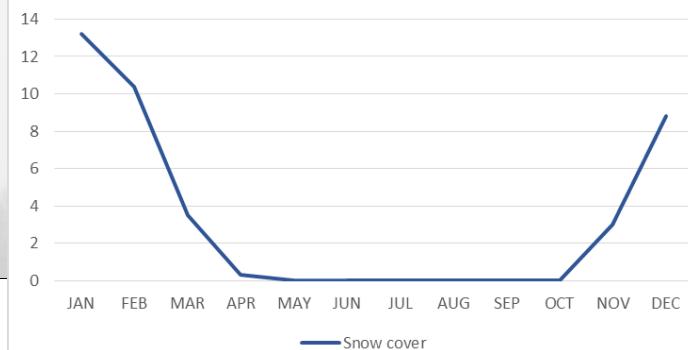
## Climate characteristic

Air Temperature

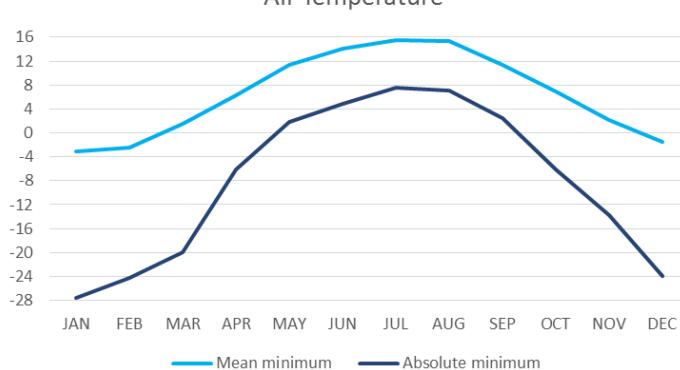


Average meteorological parameters from Novi Sad (1981-2010)

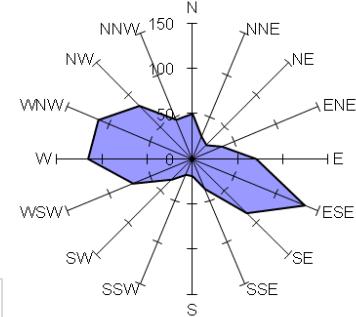
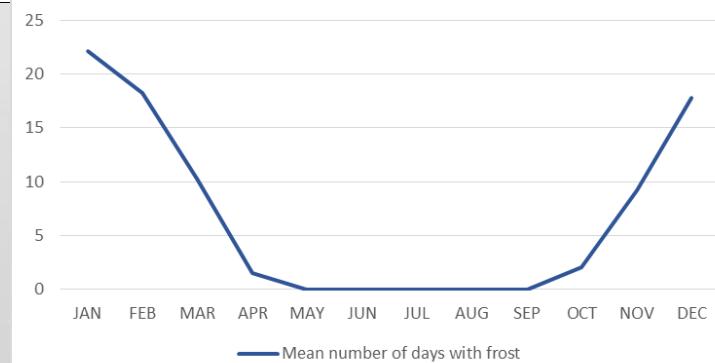
Days with snow cover



Air Temperature



Days with frost



## ***Ice conditions***

	Bezdan	Apatin		Belgrade
year	number of days with ice	number of days with ice	percentage of fairway area covered with ice	number of days with ice
1982				9
1983		38		
1987	23	40		30
2001				18
2005			max 60%	3
2006		12	60-80%	
2007			max 40%	
2008		15	60-80%	
2009			max 50%	
2010			max 5%	
2012	16	16	60-100%	
2017	28	28	60-100%	23



**2006, 2008, 2012 and 2017: years with fairway covered with ice by more than 60%**

- According to the comparison of performed bathymetric surveys from different periods - 2011 and the summer 2017, along the critical sectors during DLNL, the River bed has been changed in the following manner:
- At water levels in Danube River close to DLNL, the navigation becomes frequently critical and less safe in certain stretches of the critical sectors due to changes of the river bed below the fairway. Several modifications are performed in all critical sectors by the MCTI-Direction of Inland Waterways in order to ensure safe navigation such as:
  - The width of the fairway is reduced to the minimum of 80 meters;
  - The alignments of the fairway as well as the fairway axis are frequently modified, especially in the sector 19 (Futog), depending on the available depth in the Danube River, which should comply with Danube Commission Recommendations.

## Field surveys

November 2017



- Danube River – under regular national and international monitoring system**
- Data obtained for the technical documentation and the EIA Study preparation, until 2011**
  - water and sediment quality data for 2006-2011 period (Republic Hydro-Meteorological Service of Serbia, RHMZ) as well as the Joint Danube Survey's campaigns from 2003 and 2007 (JDS 1, JDS 2) (International Commission for the Protection of the Danube River, ICPDR),
  - Field investigation during the EIA Study preparation
- Data collected from 2012 to 2016**
  - National water and sediment quality monitoring (SEPA/RHMZ), 2012-2016
  - International water and sediment quality monitoring (ICPDR) (JDS 3), 2013
- Water Law adopted in 2010 but first implementation of the monitoring in accordance with the requirements of the Water Framework Directive (2000/60/EC (WFD)) was performed in 2012 – after the technical documentation was carried out**
- Assessment of the surface water quality from the previous years is not fully comparable with new one**
- Data to be collected during this project:**
  - Monitoring Program for the Period before the Works - BASELINE
  - Monitoring during the Works execution period
  - Monitoring after the Works completion

# Water quality

*Overview of the water and sediment quality available data (2006 – 2016)*

LOCATION	CHAINAGE	INVESTIGATIONS WHICH RESULTS COULD BE TAKEN AS PART OF BASE LEVEL DEFINITION OF WATER AND SEDIMENT QUALITY							INVESTIGATIONS WHICH RESULTS WERE CONSIDERED WITHIN EIA			
		SEPA (2012)	SEPA (2013)	SEPA (2014)	SEPA (2015)	SEPA (2016)	Joint Danube Survey (2013) JDS3	RHMZ (all)	SEPA (2006-2011)	Joint Danube Survey (2007) JDS2	Field investigation (July 2011)	Field investigation (September 2012) granulometric analysis
Bezdan	km 1426	w	w	w	w	w	w	w	w, sed	w, sed		
Bogojevo / Erdut (boundary with CRO)	km 1367	w	w	w	w	w	w	w	w, sed	w, sed		
Bačka Palanka / Ilok (boundary with CRO)	km 1300	-	-	-	-	-	w		w, sed	w, sed		
Susek SECTION 18	km 1280									sed		sed
Futog SECTION 19	km 1265											sed
Novi Sad (upstream)	km 1262	-	-	-	-	-	w		-	w, sed		
Novi Sad (downstream)	km 1252	w	w	w	w	w	w		w, sed	w, sed		
Arankina Ada SECTION 21	km 1245									sed		sed
Čortanovci SECTION 22	km 1240											sed
Beška SECTION 23	km 1230											sed
Slankamen (upstream from Tisa confluence)	km 1216	w	w	w	w	w	w		w	sed		
Belegiš (downstream from Tisa confluence)	km 1199	-	-	-	-	-	w			sed		
Preliv SECTION 24	km 1197											sed
Zemun	km 1173	w	w	w	w	w	-	w	-			
Čenta on the Tisa River (1 km from confluence)	km 1215	-	-	-	-	-	w		w	w, sed		
Titel on the Tisa River (8,7 km from confluence)	km 1215	w	w	w	w	w	-	w	-			

## Monitoring Program for the Period before the Works - BASELINE

### Field surveys

November 2017

- In order to check and complete existing data
- In accordance with the ToR
- Includes official SEPA's monitoring points, as well as points on the exact locations of the Works execution, and some additional (upstream, downstream, Tisza etc.)
- Parameters defined into the ToR
- Water: 27 sampling points on 12 different locations (L, D, M)
- Sediment: 23 sampling points

Location	Chainage	Profile GPS coordinates	Planned construction works		Number of samples for the period before works execution					
			Dredging	Traning	Water sampling			Sediment sampling		
					left (WL)	middle (WM)	right (WR)	left (S L)	middle (S M)	right (S R)
Bačka Palanka	km 1300	7374121.60 500925.63			1	1	1	1	1	1
Susek -18	km 1284+800	738552.00 5011924.00	yes							1
	km 1284+100	7386534.00 5011168.00	yes							1
	km 1282+600	7387064.00 5009830.00	yes							1
	km 1282+150	7387388.00 5009226.00	yes		1	1	1			1
Futog - 19	km 1266+500	7401049.00 5009069.00	yes	yes						1
	km 1265	7402483.00 5008901.00	yes	yes	1	1	1			1
Novi Sad (upstream)	km 1259	7408501.92 5008509.34				1				1
Novi Sad (downstream)	km 1252	7412641.00 5012282.00			1	1	1	1	1	1
Arankina Ada - 21	km 1246+750	7415968.00 5008157.00	yes							1
	km 1245+400	7416421.00 5007220.00	yes		1	1	1			1
Čortanovci - 22	km 1240+200	7420243.00 5003538.00	yes	yes					1	
	km 1239+800	7420448.00 5003462.00	yes	yes	1	1	1	1		
Beška - 23	km 1229	7430455.00 5002139.00	yes						1	
	km 1228	7432085.26 5002356.68	yes		1	1	1	1		
Slankamen (upstream from Tisa confluence)	km 1216	7442239.00 4999387.00								1
Tisa River (1 km from confluence)	km 1215 (+ 1 km)	7443500.00, 4999198.00				1				1
Preliv - 24	km 1199+800	7449556.00 4985688.00	yes		1	1	1			1
Zemun	km 1174	7453939.00 4967310.00					1			1
<b>TOTAL 1</b>					<b>8</b>	<b>10</b>	<b>9</b>	<b>6</b>	<b>8</b>	<b>9</b>
<b>TOTAL 2</b>							<b>27</b>		<b>23</b>	

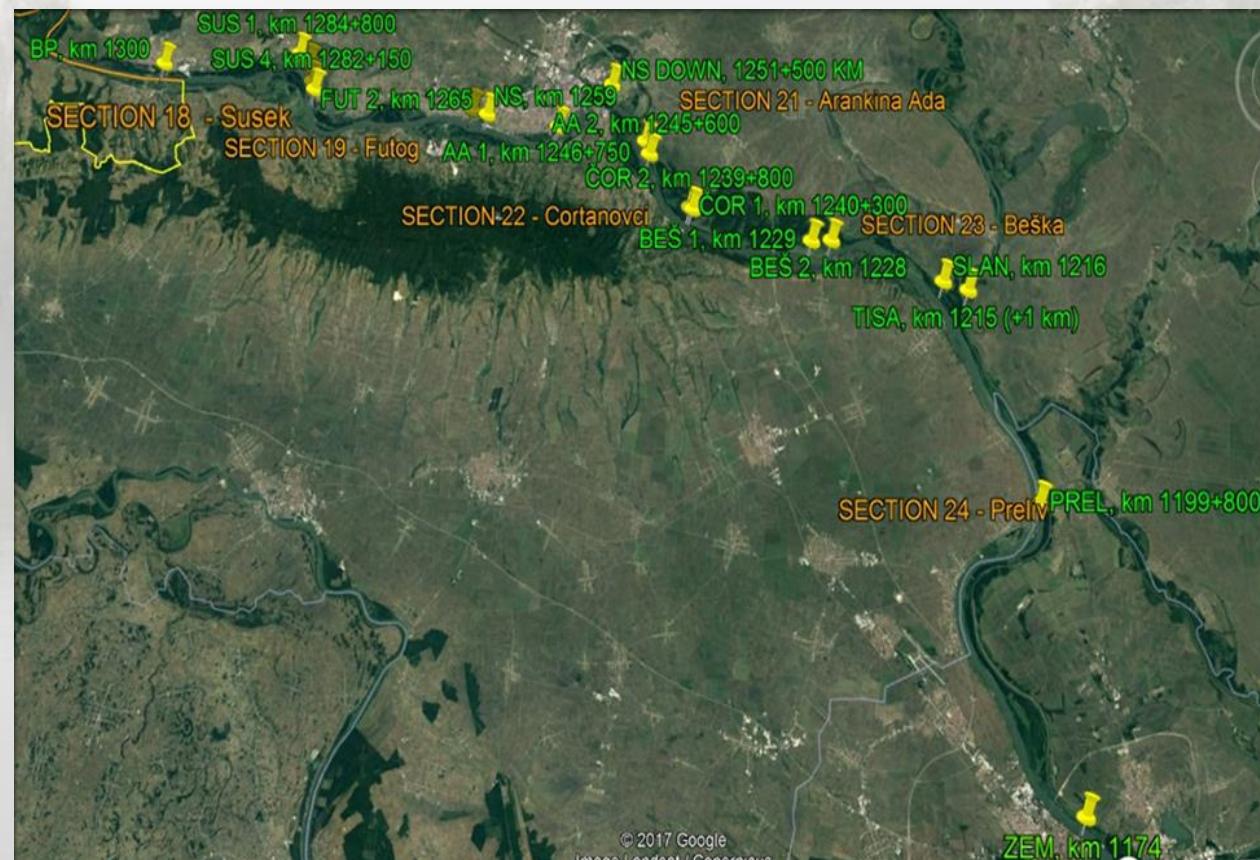
Baseline monitoring program planned for the period before works

## Monitoring Program for the Period before Works - BASELINE

### **Field surveys**

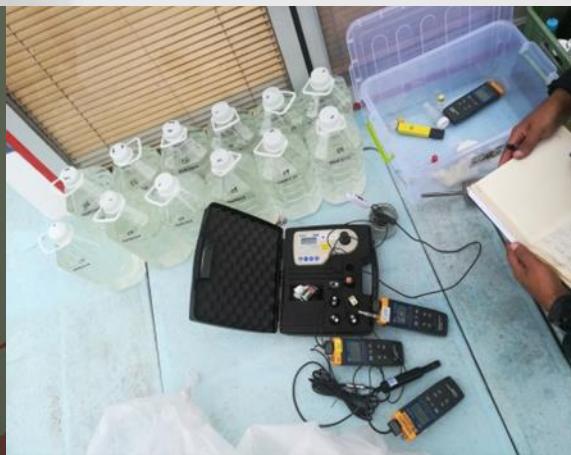
November 2017

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- In accordance with the ToR
- Includes official SEPA's monitoring points, as well as points on the exact locations of works execution, and some additional (upstream, downstream, Tisza etc.)
- Parameters defined into the ToR
- Water: 27 sampling points on 12 different locations (L, D, M)
- Sediment: 23 sampling points



*Position of the profiles where baseline sampling was done (November 2017)*

## Work on site



### On site:

- temperature,
- turbidity,
- pH value,
- conductivity,
- dissolved oxygen

*Ship and some equipment used for water and sediment sampling (November 2017)*

# Water Quality - Results

Review of the water quality results – SEM's baseline investigation before the Works, November 2017

Profile	Watercourse	Chaining	Code of water body or sampling points	Monitoring system and campaign	VALUE OF THE WATER QUALITY PARAMETERS																									
					General Parameters		Oxygen regime						Nutrients				Salinity			Metals				Microbiological parameters						
					mg/l	mg/l	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	μS/cm	μg/l	μg/l	μg/l	μg/l	μg/l	cfu/100 ml	cfu/100 ml	cfu/100 ml	cfu/100 ml	
Bačka Palanka	Danube	km 1299																												
			BP WL	Baseline, 2017	I	III	I		II				II	III	II	VII	III	I	VII	I	I	I	I	I	I	II	II	I	III	
			BP WR	Baseline, 2017	I	II	I		II				II	III	II	VII	II	I	VII	I	I	I	I	I	I	II	II	I	III	
Susek	Danube	km 1282+150	SUS 4 WL	Baseline, 2017	I	II	I		II				II	III	II	VII	III	I	VII	I	I	I	I	I	I	II	II	II	III	III
			SUS 4 WM	Baseline, 2017	I	II	I		II				II	III	II	VII	II	I	VII	I	I	I	I	I	I	II	II	I	III	III
			SUS 4 WR	Baseline, 2017	I	I	I		II				II	III	II	VII	I	I	VII	I	I	I	I	I	I	II	II	I	III	III
Futog	Danube	km 1265	FUT 2 WL	Baseline, 2017	I	I	I		II				II	III	II	VII	I	I	VII	I	I	I	I	I	I	II	II	II	II	III
			FUT 2 WM	Baseline, 2017	I	I	I		II				II	III	II	VII	I	I	VII	I	I	I	I	I	I	II	II	II	II	III
			FUT 2 WR	Baseline, 2017	I	I	I		II				I	III	II	VII	II	I	VII	I	I	I	I	I	I	II	II	II	II	IV
Novi Sad, upstream	Danube	km 1259																												
			NS WM	Baseline, 2017	I	I	I		II				II	III	II	VII	I	II	VII	I	I	I	I	I	I	II	II	II	II	IV
Novi Sad, downstream	Danube	km 1251+500																												
			NS DOWN WL	Baseline, 2017	I	I	I		II				II	III	II	VII	I	I	VII	I	I	I	I	I	I	II	II	IV	IV	IV
			NS DOWN WM	Baseline, 2017	I	I	I		II				I	III	II	VII	III	I	VII	I	I	I	I	I	I	II	II	I	IV	IV
			NS DOWN WR	Baseline, 2017	I	I	I		II				II	III	II	VII	I	I	VII	I	I	I	I	I	I	II	II	I	I	III
Arankina Ada	Danube	km 1246+750																												
			AA 1 WL	Baseline, 2017	I	I	I		II				II	III	II	VII	III	II	VII	I	I	I	I	I	I	II	II	II	II	III
			AA 1 WM	Baseline, 2017	I	I	I		II				II	III	II	VII	III	II	VII	I	I	I	I	I	I	II	II	II	II	III
			AA 1 WR	Baseline, 2017	I	I	I		II				II	III	II	VII	III	II	VII	I	I	I	I	I	I	II	II	II	II	III
Čortanovci	Danube	km 1239+800																												
			ČOR 2 WL	Baseline, 2017	I	I	I		II				II	III	II	VII	III	I	VII	I	I	I	I	I	I	II	II	II	II	IV
			ČOR 2 WM	Baseline, 2017	I	I	I		II				II	III	II	VII	III	I	VII	I	I	I	I	I	I	II	II	I	II	II
			COR 2 WR	Baseline, 2017	I	I	I		II				II	III	I	VII	III	I	VII	I	I	I	I	I	I	II	II	I	II	III
Beška	Danube	km 1228																												
			BEŠ 2 WL	Baseline, 2017	I	I	I		II				II	III	II	VII	III	I	VII	I	I	I	I	I	I	II	II	II	II	IV
			BEŠ 2 WM	Baseline, 2017	I	I	I		II				II	III	II	VII	III	I	VII	I	I	I	I	I	I	II	II	II	II	III
			BEŠ 2 WR	Baseline, 2017	I	I	I		II				II	III	II	VII	III	I	VII	I	I	I	I	I	I	II	II	II	II	IV
Slankamen	Danube	km 1216																												
Tisa	Tisa		SLAN WM	Baseline, 2017	I	I	I		II				II	III	II	VII	III	I	VII	I	I	I	I	I	I	II	II	II	II	III
			1 km from confluence on km 1215	TISA WM	Baseline, 2017	I	I	I		III				II	II	I	VII	IV	I	VII	I	I	I	I	I	II	II	III	III	II
Preliv			PREL WL	Baseline, 2017	I	I	I		II				II	III	I	VII	III	II	VII	I	I	I	I	I	I	II	II	II	II	IV
			PREL WM	Baseline, 2017	I	I	I		II				II	III	I	VII	I	II	VII	I	I	I	I	I	I	II	II	I	III	III
Zemun	Danube	km 1174			ZEM WR	Baseline, 2017	I	I	I		II			II	III	II	II	III	I	II	II	I	I	I	I	II	II	IV	IV	IV

# Water Quality - Results

*Review of priority and priority hazardous substances detection – SEM's baseline investigation before works, November 2017*

Profile	Code of water body or sampling points	Monitoring system and campaign	Priority and priority hazardous substances
Bačka Palanka	BP WL BP WR	Baseline, 2017 Baseline, 2017	lead (II), cadmium (III)
Susek	SUS 4 WL SUS 4 WM SUS 4 WR	Baseline, 2017 Baseline, 2017 Baseline, 2017	cadmium (III)
Futog	FUT 2 WL FUT 2 WM FUT 2 WR	Baseline, 2017 Baseline, 2017 Baseline, 2017	lead (III)
Novi Sad, upstream	NS WM	Baseline, 2017	
Novi Sad, downstream	NS DOWN WL NS DOWN WM NS DOWN WR	Baseline, 2017 Baseline, 2017 Baseline, 2017	lead (III)
Arankina Ada	AA 1 WL AA 1 WM AA 1 WR	Baseline, 2017 Baseline, 2017 Baseline, 2017	mercury (V)
Čortanovci	ČOR 2 WL ČOR 2 WM ČOR 2 WR	Baseline, 2017 Baseline, 2017 Baseline, 2017	lead (III)
Beška	BEŠ 2 WL BEŠ 2 WM BEŠ 2 WR	Baseline, 2017 Baseline, 2017 Baseline, 2017	
Slankamen	SLAN WM	Baseline, 2017	
Tis a	TISA WM	Baseline, 2017	lead (III)
Preliv	PREL WL PREL WM	Baseline, 2017 Baseline, 2017	
Zemun	ZEM WR	Baseline, 2017	lead (III), cadmium (III)

# Sediment Quality – Results

*Review of sediment quality results – SEM's baseline investigation before the Works, November 2017*

# Sediment Quality – Results

*Review of sediment quality results – SEM's baseline investigation before the Works, November 2017*

Profile	Code of water body or sampling points	Monitoring system and campaign	MDK AND VALUE OF THE SEDIMENT QUALITY PARAMETERS																																
			MDK		DM	OC	Metal Content						PCBs		Polycyclic aromatic hydrocarbons (PAHs)								Oils	Pesticides				TOC	Granulometric composition						
					Determination of the dry matter content	Determination of the content of organic matter by loss on ignition	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Mercury (Hg)	Copper (Cu)	Nickel (Ni)	Lead (Pb)	Zinc (Zn)	Polychlorinated biphenyls (PCBs) (mDa) (PCB 28, 52, 101, 118, 138, 153 and 180)		Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Chrysene	Phenanthrene	Indeno(1,2,3-cd) pyrene	Fluoranthene	Naphthalene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	PAHs (total)	Mineral oils	DDT (total)	Cyclodextrin pesticides	HCH (total)	Alpha-endoendosulfane	Heptachlor	Heptachlor epoxide	Total organic carbon (TOC)
					%	%																					TOC	Granulometric composition							
																											TOC	Granulometric composition							
			Limit values for the sediment quality assessment for dredging of sediment from the watercourse (Annex 3, Table 2 of Regulation)																																
			MDK 4	/	/	29	6.3	194	6.7	82	63	317	268	1	40	/	/	/	/	/	/	/	/	5000	4000	4000	2000	4000	4000	/	/	/			
			MDK 3	/	/	29	3.9	194	1.1	39	14	317	268	0.2	10	/	/	/	/	/	/	/	/	3000	40	/	/	/	/	/	/	/	/		
			MDK 2	/	/	29	1	194	0.33	16	11	317	178	/	1	/	/	/	/	/	/	/	1000	10	/	/	/	/	/	/	/	/			
			MDK 1	/	/	15	0.4	51	0.2	16	11	51	52	0.02	1	/	/	/	/	/	/	/	50	10	5	10	0.01	0.7	0.002	/	/	/			
			Limit values for the status and trend of sediment quality assessment (Annex 3, Table 1 of Regulation)																																
			Remed. Value	/	/	55	12	380	10	190	210	530	720	1									40	5000	4000	4000	2000	4000	4000	4000	4000	4000			
			MDK	/	/	42	6.4	240	1.6	110	44	310	430	200	0.1	0.4	3	11	0.5	6	3	0.1	8	2	10	3000	1	68	0.002						
			Target value	/	/	29	0.8	100	0.3	36	35	85	140	20	0.001	0.003	0.003	0.1	0.005	0.06	0.03	0.001	0.08	0.02	1	50	10	5	10	0.01	0.7	2E-04			
Bačka Palanka	BP WL	Baseline, 2017	69	0.35	1.5	<0.1	4.3	<0.01	2.5	3.9	3	14	<0.016	0.245	<0.001	<0.003	<0.003	0.037	<0.001	<0.001	<0.001	<0.002	<0.003	0.282	<10	<1.0	<1.0	<1.0	<0.01	<0.70	<0.0002	1426	99	0.8	
Susek	SUS 1 SR	Baseline, 2017																																	
	SUS 2 SR	Baseline, 2017																																	
	SUS 3 SM	Baseline, 2017																																	
	SUS 4 SM	Baseline, 2017																																	
Futog	FUT 1 SM	Baseline, 2017																																	
	FUT 2 SM	Baseline, 2017																																	
Novi Sad, upstream	NS SM	Baseline, 2017																																	
Novi Sad, downstream	NS DOWN SM	Baseline, 2017																																	
	NS DOWN SR	Baseline, 2017																																	
Arankina Ada	AA 1 SM	Baseline, 2017																																	
	AA 2 SR	Baseline, 2017																																	
Čortanovci	ČOR 1 SL	Baseline, 2017																																	
	ČOR 2 SL	Baseline, 2017																																	
Beška	BEŠ 1 SL	Baseline, 2017																																	
	BEŠ 2 SM	Baseline, 2017																																	
Slankamen	SLAN SR	Baseline, 2017																																	
Tisa	TISA SR	Baseline, 2017																																	
Preliv	PREL SM	Baseline, 2017																																	
Zemun	ZEM SR	Baseline, 2017	57	4.3	4.9	0.3	35	0.04	25	25	12	80	<0.016	0.02	<0.001	<0.003	<0.003	0.01	<0.001	0.03	0.01	<0.002	<0.003	0.07	<10	<1.0	<1.0	<1.0	<0.01	<0.70	<0.0002	18110	69	21.5	

# Water and Sediment quality – comparing results

# UPSTREAM FROM THE PROJECT AREA

## UPSTREAM FROM THE PROJECT AREA

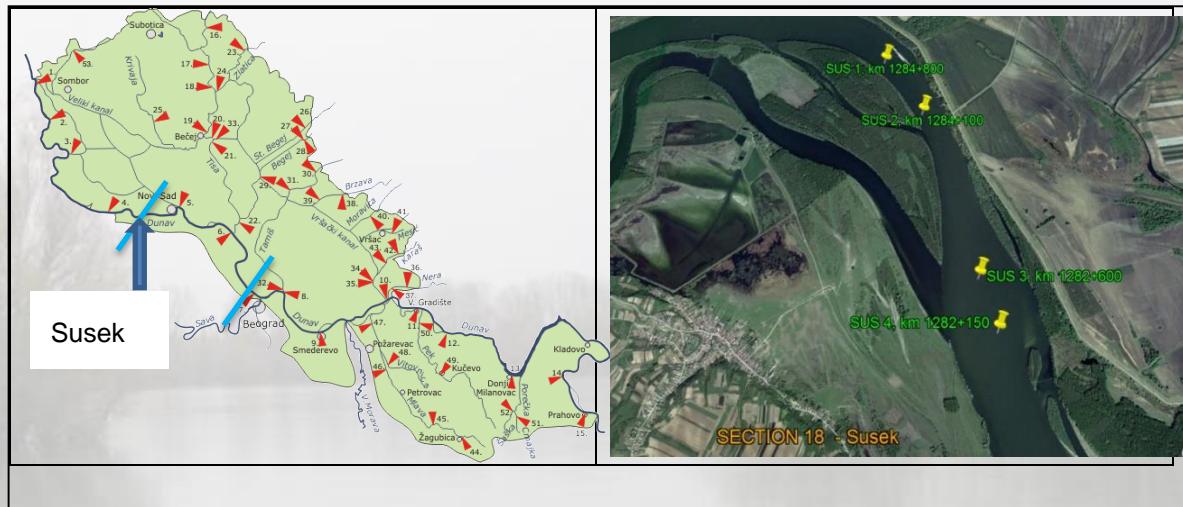
No other results for sediments

Profile	Code of water body or sampling points	Monitoring system and campaign	Priority and priority hazardous substances
<b>Baćka Palanka</b>			
	BP WL	Baseline, 2017	lead (II), cadmium (III)
	BP WR	Baseline, 2017	

# Water and Sediment quality – comparing results

## PROJECT AREA – SECTION 18 (SUSEK)

No other results for water



Profile	Code of water body or sampling points	Monitoring system and campaign	VALUE OF THE WATER QUALITY PARAMETERS																											
			General Parameters				Oxygen regime				Nutrients				Salinity				Metals				Organic substances				Microbiological parameters			
			mg/l	mg/l	mg/l	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	μS/cm	μg/l	μg/l	μg/l	μg/l	μg/l	mg/l	cfu/100	cfu/100	cfu/100	cfu/100 ml			
Susek	SUS 4 WL	Baseline, 2017		=												-	-	-	-	-	-									
	SUS 4 WM	Baseline, 2017		=												-	-	-	-	-	-									
	SUS 4 WR	Baseline, 2017		-												-	-	-	-	-	-									

# Water and Sediment quality – comparing results

## PROJECT AREA – SECTION 18 (SUSEK)

Profile	Code of water body or sampling points	Monitoring system and campaign	MDK AND VALUE OF THE SEDIMENT QUALITY PARAMETERS																																							
			MDK		DM	OC	Metal Content							PCBs	Polycyclic aromatic hydrocarbons (PAHs)							Oils	Pesticides				TOC	Granulometric composition														
						%	Determination of the dry matter content		Determination of the content of organic matter by loss by ignition		Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Mercury (Hg)	Copper (Cu)	Nickel (Ni)	Lead (Pb)	Zinc (Zn)	Polychlorinated biphenyls (PCBs) (total) (PCB 28, 52, 101, 118, 138, 153 and 180)	Anthracene	Benzo (a) anthracene	Benzo (a) pyrene	Chrysene	Phenanthrene	Indeno (1,2,3-cd) pyrene	Fluoranthene	Naphthalene	Benzo (g, h, i) perylene	Benzo (k) fluorantene	PAHs (total)	Mineral oils	DDT (total)	Cyclodial pesticides	HCH (total)	Alpha-endosulfane	Heptachlor	Heptachlor epoxide	Total organic carbon (TOC)	Sand (> 0.05 mm)	Powder (0.05 - 0.002 mm)	Clay (<0.002 mm)	
Limit values for the sediment quality assessment for dredging of sediment from the watercourse (Annex 3, Table 2 of Regulation)																																										
MDK 4	/	/	29	6.3	194	6.7	82	63	317	268	1	40	/	/	/	/	/	/	/	/	/	5000	4000	4000	2000	4000	4000	4000	/	/	/	/										
MDK 3	/	/	29	3.9	194	1.1	39	14	317	268	0.2	10	/	/	/	/	/	/	/	/	/	3000	40	/	/	/	/	/	/	/	/	/	/									
MDK 2	/	/	29	1	194	0.33	16	11	317	178	/	1	/	/	/	/	/	/	/	/	1000	10	/	/	/	/	/	/	/	/	/	/										
MDK 1	/	/	15	0.4	51	0.2	16	11	51	52	0.02	1	/	/	/	/	/	/	/	/	50	10	5	10	0.01	0.7	0.002	/	/	/	/											
Limit values for the status and trend of sediment quality assessment (Annex 3, Table 1 of Regulation)																																										
Remed. Value	/	/	55	12	380	10	190	210	530	720	1										40	5000	4000	4000	2000	4000	4000	4000	/	/	/	/										
MDK	/	/	42	6.4	240	1.6	110	44	310	430	200	0.1	0.4	3	11	0.5	6	3	0.1	8	2	10	3000		1	68	0.002															
Target value	/	/	29	0.8	100	0.3	36	35	85	140	20	0.001	0.003	0.003	0.1	0.005	0.06	0.03	0.001	0.08	0.02	1	50	10	5	10	0.01	0.7	2E-04													
Susek	SUS 1 SR	Baseline, 2017	69	0.45	1.6	<0.1	3.7	<0.01	2.3	4.6	3.2	19	<0.016	0.092	<0.001	<0.003	<0.003	0.026	<0.001	<0.001	<0.002	<0.003	0.118	<10	<1.0	<1.0	<1.0	<0.01	<0.70	<0.0002	1120	99	0.3	0.7								
Sus 2 SR	Baseline, 2017	70	0.41	1.5	<0.1	4.6	<0.01	2.5	3.6	2.9	12	<0.016	0.247	<0.001	<0.003	<0.003	0.041	<0.001	<0.001	<0.004	<0.002	<0.003	0.332	<10	<1.0	<1.0	<1.0	<0.01	<0.70	<0.0002	1576	99	0.8	0.2								
SUS 3 SM	Baseline, 2017	68	0.28	1.6	<0.1	3.5	<0.01	2	3.9	3.1	13	<0.016	0.161	<0.001	<0.003	<0.008	0.028	<0.001	<0.001	0.061	<0.002	<0.003	0.258	<10	<1.0	<1.0	<1.0	<0.01	<0.70	<0.0002	1576	99	0.8	0.2								
SUS 4 SM	Baseline, 2017	68	0.31	2.9	<0.1	4.2	0.02	2.3	5.6	4.1	23	<0.016	0.155	<0.001	<0.003	<0.003	0.041	<0.001	<0.001	0.022	<0.002	<0.003	0.218	<10	<1.0	<1.0	<1.0	<0.01	<0.70	<0.0002	1166	99	0.7	0.3								
BS1 - SUS 1	EIA invest, 2012	/	/	2.5	<0.1	7.9	<0.01	2.3	8.3	2.1	23	/	n.d.	n.d.	n.d.	0.01	0.006	n.d.	0.007	n.d.	0.005	n.d.	n.d.	/	/	/	cld	cld	/	/	/	/										
BS2 - SUS 4	EIA invest, 2012	/	/	2.5	<0.1	9.3	<0.01	8	8.9	2.6	26	n.d.	0.006	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	/	/	/	cld	cld	/	/	/	/										
Susek	EIA invest, 2011	48	2.9	0	/	<0.12	<0.0005	<0.06	<0.24	0	n.d.	/	/	/	/	/	/	/	/	/	/	/	n.d.	n.d.	/	/	/	n.d.	n.d.	/	/											

## Water and Sediment quality – comparing results

## **UNPROJECT AREA – INTERSECTION – NOVI SAD, upstream and downstream**



## UNPROJECT AREA – INTERSECTION – NOVI SAD, upstream and downstream

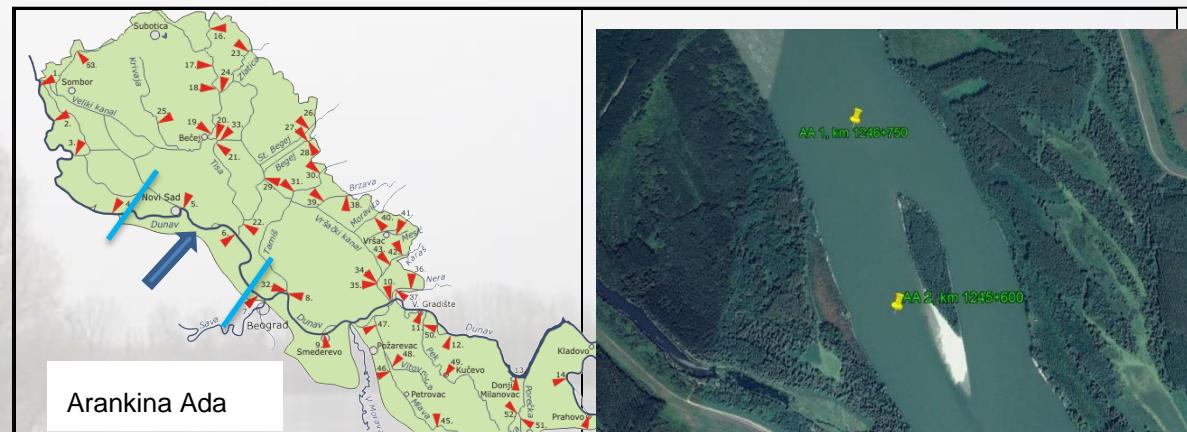
Profile	Code of water body or sampling points	Monitoring system and campaign	Priority and priority hazardous substances
<b>Novi Sad, upstream</b>			
	NS WM	Baseline, 2017	
	JDS 32, middle	JDS 3, 2013	
	D8, right	SEPA, 2013	
		SEPA, 2014	1xPb-diss. (III-IV), 1xNi-diss. (III-IV)
		SEPA, 2015	1x Ni-diss. (III/IV)
		SEPA, 2016	
<b>Novi Sad, downstream</b>			
	NS DOWN WL	Baseline, 2017	lead (III)
	NS DOWN WM	Baseline, 2017	
	NS DOWN WR	Baseline, 2017	
	JDS 33, middle	JDS 3, 2013	

No other results for sediments.

## Water and Sediment quality – comparing results

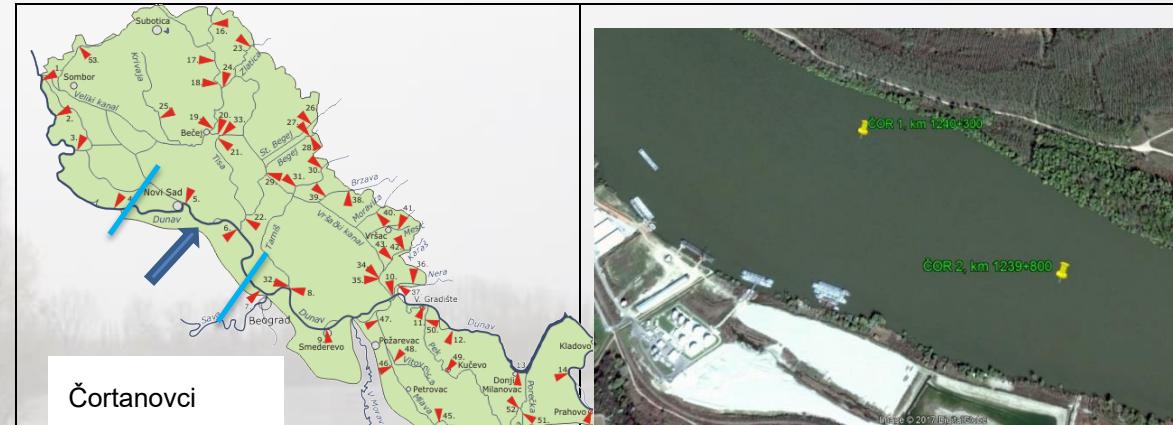
## **PROJECT AREA – SECTION 21 (ARANKINA ADA)**

No other results for water



## PROJECT AREA – SECTION 22 (ČORTANOVCI)

No other results for water

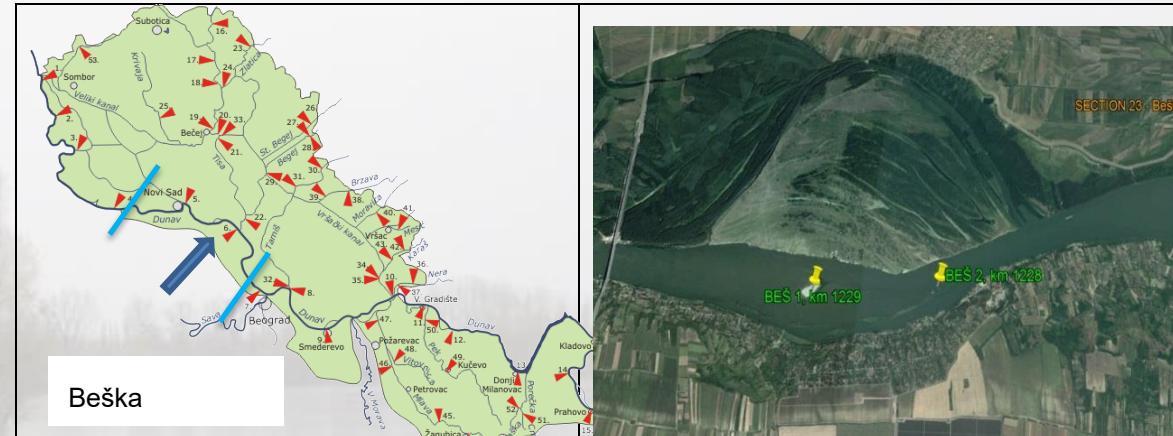


Profile	Code of water body or sampling points	Monitoring system and campaign	MDK AND VALUE OF THE SEDIMENT QUALITY PARAMETERS																																
			MDK		DM	OC	Metal Content						PCBs		Polycyclic aromatic hydrocarbons (PAHs)										Oils				Pesticides				TOC	Granulometric composition	
			Determination of the dry matter content	Determination of the content of organic matter by loss on ignition	Asbestos(As)	Cadmium(Cd)	Chromium(Cr)	Mercury(Hg)	Copper(Cu)	Nickel(Ni)	Lead(Pb)	Zinc(Zn)	Polychlorinated biphenyls (PCBs) total (PC-B-29, 52, 101, 118, 133, 163 and 160)	Benz(a)anthracene	Benz(a)pyrene	Chrysene	Phenanthrene	Indeno(1,2,3- <i>a</i> )perylene	Fluoranthene	Naphthalene	Benz(g,h,i)perylene	PAHs (total)	Mineral oils	DDT (total)	Cyclodiol pesticides	HCH (total)	Alpha-endosulfane	Heptachlor	Heptachlor epoxide	Total organic carbon (TOC)	S and (< 0.05 mm)	Powder (0.05 - 0.002 mm)	Clay (< 0.002 mm)		
Limit values for the sediment quality assessment for dredging of sediment from the watercourse (Annex 3, Table 2 of Regulation)																																			
MDK 4	/	/	29	6.3	194	6.7	82	63	317	268	1	40	/	/	/	/	/	/	/	/	/	5000	4000	4000	2000	4000	4000	/	/	/					
MDK 3	/	/	29	3.9	194	1.1	39	14	317	268	0.2	10	/	/	/	/	/	/	/	/	/	3000	40	/	/	/	/	/	/	/	/				
MDK 2	/	/	29	1	194	0.33	16	11	317	178	/	1	/	/	/	/	/	/	/	/	1000	10	/	/	/	/	/	/	/	/	/				
MDK 1	/	/	15	0.4	51	0.2	16	11	51	52	0.02	1	/	/	/	/	/	/	/	/	50	10	5	10	0.01	0.7	0.002	/	/	/					
Limit values for the status and trend of sediment quality assessment (Annex 3, Table 1 of Regulation)																																			
Remed. Value	/	/	55	12	380	10	190	210	530	720	1										40	5000	4000	4000	2000	4000	4000	/	/	/					
MDK	/	/	42	6.4	240	1.6	110	44	310	430	200	0.1	0.4	3	11	0.5	6	3	0.1	8	2	10	3000	1	68	0.002									
Target value	/	/	29	0.8	100	0.3	36	35	85	140	20	0.001	0.003	0.003	0.1	0.005	0.06	0.03	0.001	0.08	0.02	1	50	10	5	10	0.01	0.7	2E-04						
Čortanovci	ČOR 1 SL	Baseline, 2017	68	0.4	1.6	<0.1	5.7	<0.01	5.2	5.1	4.4	22	<0.016	0.084	<0.001	<0.003	<0.003	0.01	<0.001	<0.002	<0.003	0.074	<10	<1.0	<1.0	<1.0	<0.70	<0.0002	1882	95	4.2	0.8			
Čortanovci	ČOR 2 SL	Baseline, 2017	67	0.34	1.7	<0.1	5	0.02	3	5.5	3.4	21	<0.016	<0.001	<0.001	<0.003	<0.003	<0.001	<0.001	<0.002	<0.003	<0.022	<10	<1.0	<1.0	<1.0	<0.70	<0.0002	223	99	0.7	0.3			
Čortanovci	BC1 - ČOR 1	EIA invest, 2012	/	/	1.5	<0.1	14	<0.01	3.3	12	2.8	41	n.d.	0.005	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<10d	<10d	/	/	/			
Čortanovci	BC2 - ČOR 2	EIA invest, 2012	/	/	2.8	<0.1	22	<0.01	6.7	17	6.1	44	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<10d	<10d	/	/	/				

# Water and Sediment quality – comparing results

## PROJECT AREA – SECTION 23 (BEŠKA)

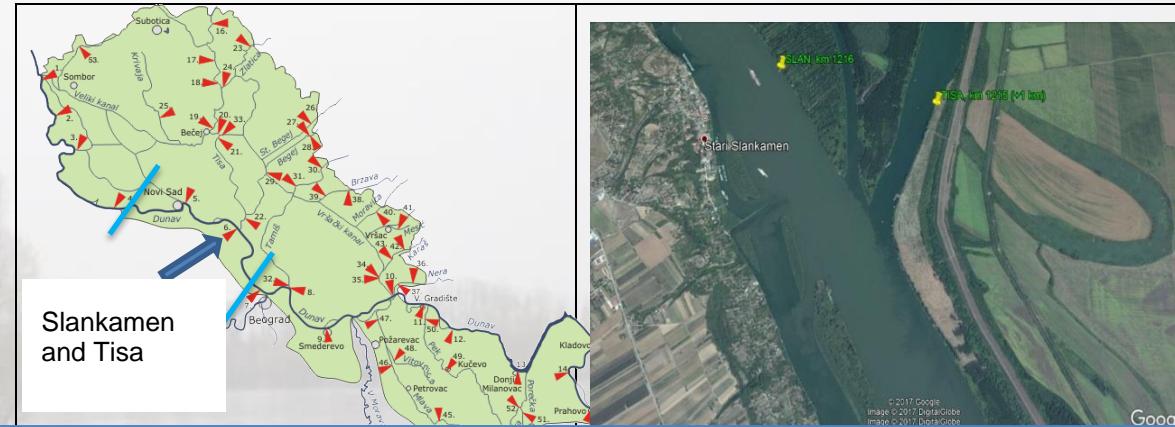
No other results for water



Profile	Code of water body or sampling points	Monitoring system and campaign	MDK AND VALUE OF THE SEDIMENT QUALITY PARAMETERS																																											
			MDK		Determination of the dry matter content		Determination of the content of organic matter by loss on ignition		Metal Content										PCBs		Polycyclic aromatic hydrocarbons (PAHs)										TOC	Granulometric composition														
			DM	OC	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Mercury (Hg)	Copper (Cu)	Nickel (Ni)	Lead (Pb)	Zinc (Zn)	Polychlorinated biphenyls (PCBs) (total) (PCB 28, 52, 101, 118, 138, 153 and 180)										Anthracene	Benzo (a)anthracene	Benzo (a)pyrene	Chrysene	Phenanthrene	Indeno (1,2,3-cd) pyrene	Fluoranthene	Naphthalene	Benzo (g, h, i) perylene	Benzo (k) fluoranthene	PAHs (total)	Mineral oils	DDT (total)	Cyclodial pesticides	HCH (total)	Alpha-endosulfane	Heptachlor	Heptachlor epoxide	Total organic carbon (TOC)	Sand (2 - 0.05 mm)	Powder (0.05 - 0.002 mm)	Clay (<0.002 mm)		
			%	%																			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%												
Limit values for the sediment quality assessment for dredging of sediment from the watercourse (Annex 3, Table 2 of Regulation)																																														
MDK 4			/	/	29	6.3	194	6.7	82	63	317	268	1	40	/	/	/	/	/	/	/	/	/	/	5000	4000	4000	2000	4000	4000	4000	/	/	/	/											
MDK 3			/	/	29	3.9	194	1.1	39	14	317	268	0.2	10	/	/	/	/	/	/	/	/	/	/	3000	40	/	/	/	/	/	/	/	/	/											
MDK 2			/	/	29	1	194	0.33	16	11	317	178	/	1	/	/	/	/	/	/	/	/	/	/	1000	10	/	/	/	/	/	/	/	/	/											
MDK 1			/	/	15	0.4	51	0.2	16	11	51	52	0.02	1	/	/	/	/	/	/	/	/	/	/	50	10	5	10	0.01	0.7	0.002	/	/	/	/											
Limit values for the status and trend of sediment quality assessment (Annex 3, Table 1 of Regulation)																																														
Remed. Value			/	/	55	12	380	10	190	210	530	720	1												40	5000	4000	4000	2000	4000	4000	4000														
MDK			/	/	42	6.4	240	1.6	110	44	310	430	200	0.1	0.4	3	11	0.5	6	3	0.1	8	2	10	3000		1	68	0.002																	
Target value			/	/	29	0.8	100	0.3	36	35	85	140	20	0.001	0.003	0.003	0.1	0.005	0.06	0.03	0.001	0.08	0.02	1	50	10	5	10	0.01	0.7	2E-04															
<b>Beška</b>			<b>BEŠ 1 SL</b>	Baseline, 2017	70	0.3	1.3	<0.1	3.8	0.01	2.6	3.9	3.1	14	<0.016	0.077	<0.001	0.004	<0.003	0.012	<0.001	<0.001	0.11	<0.002	<0.003	0.104	<10	<1.0	<1.0	<1.0	<0.01	<0.70	<0.0002	340	99	0.5	0.5									
			<b>BEŠ 2 SM</b>	Baseline, 2017	65	0.83	1.7	<0.1	9	<0.01	7.7	6.5	4.6	27	<0.016	0.026	<0.001	<0.003	0.019	<0.001	<0.001	<0.001	<0.001	<0.002	<0.003	0.045	<10	<1.0	<1.0	<1.0	<0.01	<0.70	<0.0002	2874	94	4.2	1.8									
			<b>BB1 - BEŠ 1</b>	EIA invest, 2012	/	/	3.6	<0.1	14	<0.01	4.6	12	6.2	43	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<10d	<10d	<10d	<10d													
			<b>BB2 - BEŠ 2</b>	EIA invest, 2012	/	/	2.5	<0.1	10	<0.01	3.4	11	5.6	39	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<10d	<10d	<10d	<10d													

# Water and Sediment quality – comparing results

## UNPROJECT AREA – INTERSECTION – SLANKAMEN and TISZA (on Tisza River)



Profile	Code of water body or sampling points	Monitoring system and campaign	VALUE OF THE WATER QUALITY PARAMETERS																										
			General Parameters		Oxygen regime				Nutrients				Salinity				Metals				Organic substances				Microbiological parameters				
			mg/l	mg/l	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	µS/cm	µg/l	µg/l	µg/l	µg/l	mg/l	mg/l	cfu/100	cfu/100	cfu/100	cfu/100 ml	
Slankamen																													
SLAN WM	Baseline, 2017	I I I	II	II	III II	IV	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	II III III III					
JDS 34, middle	JDS 3, 2013	I III-V III	III-V	III	I	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	III	II	II	II	
D7, right	SEPA, 2013	II-IV	III-V	III	I	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	
	SEPA, 2014	II-IV	III-V	III	I	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	
	SEPA, 2015	II-IV	III-V	III	I	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	
	SEPA, 2016	II-IV	III-V	III	I	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	
Tisa																													
TISA WM	Baseline, 2017	I I I	III	II	II	I	IV	I	IV	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	III III III	II	II	II	
JDS 35, middle	JDS 3, 2013	I I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	III III	II	II	II	
TIS_1, right	SEPA, 2013	IV	III-V	II	I	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	II	IV	III	III	III	
	SEPA, 2014	I-IV	IV	III-V	III	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	III	I	III	III	
	SEPA, 2015	I-IV	IV	III-V	III	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	IV	II	III	IV	
	SEPA, 2016	I-IV	IV	III-V	III	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	V	III	III	III	

# Water and Sediment quality – comparing results

## UNPROJECT AREA – INTERSECTION – SLANKAMEN and TISZA (on Tisza River)

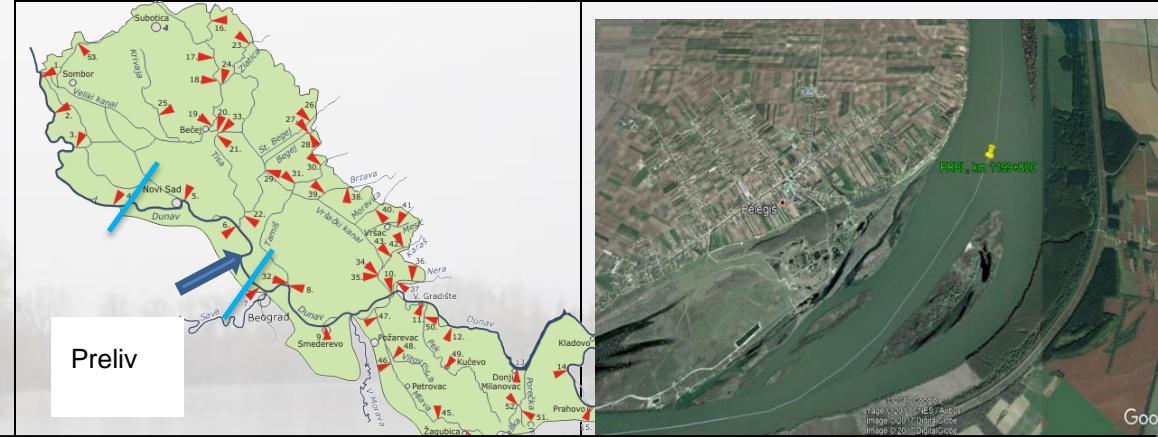
Profile	Code of water body or sampling points	Monitoring system and campaign	Priority and priority hazardous substances					
			Monitoring system and campaign			Priority and priority hazardous substances		
Slankamen								
	SLAN WM JDS 34, middle D7, right	Baseline, 2017 JDS 3, 2013 SEPA, 2013 SEPA, 2014 SEPA, 2015 SEPA, 2016					1xPb-diss. (III-IV), 4xNi-diss. (III-IV) Benzo(a)piren 1x (III/IV),	
Tisa								
	TISA WM JDS 35, middle TIS_1, right	Baseline, 2017 JDS 3, 2013 SEPA, 2013 SEPA, 2014 SEPA, 2015 SEPA, 2016					lead (III) 1xPb-diss. (III-IV), 9xNi-diss. (III-IV) 3x Ni-diss. (II/IV), 1x Benzo(b)fluoruran (>LOQ), 1x Benzo(k)fluoruran (>LOQ) Benzo(a)piren 1x (III/IV),	

### MDK AND VALUE OF THE SEDIMENT QUALITY PARAMETERS

Profile	Code of water body or sampling points	Monitoring system and campaign	MDK	DM	OC	Metal Content					PCBs	Polycyclic aromatic hydrocarbons (PAHs)								Oils	Pesticides					TOC	Granulometric composition								
				Determination of the dry matter content		Determination of the content of organic matter by loss by ignition					PCBs	Polycyclic aromatic hydrocarbons (PAHs)								Oils	Pesticides					TOC	Granulometric composition								
				%	%						PCBs									Oils						TOC	Granulometric composition								
											PCBs									Oils						TOC	Granulometric composition								
Limit values for the sediment quality assessment for dredging of sediment from the watercourse (Annex 3, Table 2 of Regulation)																																			
MDK 4	/	/	29	6.3	194	6.7	82	63	317	268	1	40	/	/	/	/	/	/	/	5000	4000	4000	2000	4000	4000	4000	/	/	/						
MDK 3	/	/	29	3.9	194	1.1	39	14	317	268	0.2	10	/	/	/	/	/	/	/	3000	40	/	/	/	/	/	/	/	/	/					
MDK 2	/	/	29	1	194	0.33	16	11	317	178	/	1	/	/	/	/	/	/	/	1000	10	/	/	/	/	/	/	/	/	/					
MDK 1	/	/	15	0.4	51	0.2	16	11	51	52	0.02	1	/	/	/	/	/	/	/	50	10	5	10	0.01	0.7	0.002	/	/	/						
Limit values for the status and trend of sediment quality assessment (Annex 3, Table 1 of Regulation)																																			
Remed. Value	/	/	55	12	380	10	190	210	530	720	1									40	5000	4000	4000	2000	4000	4000	/	/	/						
MDK	/	/	42	6.4	240	1.6	110	44	310	430	200	0.1	0.4	3	11	0.5	6	3	0.1	8	2	10	3000	1	68	0.002									
Target value	/	/	29	0.8	100	0.3	36	35	85	140	20	0.001	0.003	0.003	0.1	0.005	0.06	0.03	0.001	0.08	0.02	1	50	10	5	10	0.01	0.7	2E-04						
Slankamen	SLAN SR	Baseline, 2017 D7, right SEPA, 2012	67	0.3	1.5	<0.1	6.3	<0.01	3.1	5.1	3.6	17	<0.016	0.039	0.012	<0.003	0.01	0.038	<0.001	0.079	0.016	<0.002	<0.003	0.194	<10	<1.0	<1.0	<1.0	<0.01	<0.70	<0.0002	1436	99	0.4	0.6
Tisa	TISA SR	Baseline, 2017	69	0.88	2.1	0.3	9.1	0.02	9.9	8.6	7.7	41	<0.016	0.005	0.004	0.006	0.005	0.006	<0.001	<0.001	<0.001	<0.002	<0.003	0.026	<10	<1.0	<1.0	<1.0	<0.01	<0.70	<0.0002	5206	88	6.2	5.8

# Water and Sediment quality – comparing results

## PROJECT AREA – SECTION 24 (PRELIV)



Profile	Code of water body or sampling points	Monitoring system and campaign	VALUE OF THE WATER QUALITY PARAMETERS																											
			General Parameters				Oxygen regime				Nutrients				Salinity				Metals				Organic substances				Microbiological parameters			
			mg/l	mg/l	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	μS/cm	μg/l	μg/l	μg/l	μg/l	μg/l	mg/l	mg/l	cfu/100	cfu/100	cfu/100	cfu/100 ml		
Preliv	PREL WL	Baseline, 2017	I	I	I		=		=	III	-	III	=	-	-	-	-	-	-	-	-	-	II	-		=	=	III	V	
	PREL WM	Baseline, 2017	I	I	I		=		=	III	-	III	-	-	-	-	-	-	-	-	-	-	-	-		=	=	I	III	III
	JDS 36, middle Belegiš	JDS 3, 2013	I	III-V	II				=	III			=	III	-	-	-	-	-	-	-	-	-							

# Water and Sediment quality – comparing results

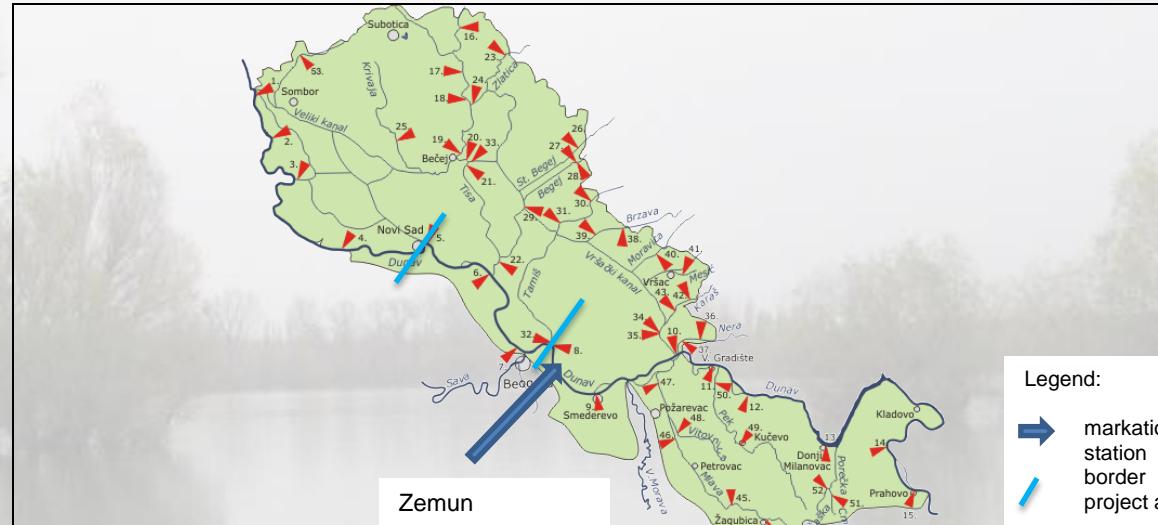
## PROJECT AREA – SECTION 24 (PRELIV)

Profile	Code of water body or sampling points	Monitoring system and campaign	MDK AND VALUE OF THE SEDIMENT QUALITY PARAMETERS																																
			MDK		DM	OC	Metal Content						PCBs		Polycyclic aromatic hydrocarbons (PAHs)						Oils		Pesticides				TOC	Granulometric composition							
			Determination of the dry matter content	Determination of the content of organic matter by loss on ignition			Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Mercury (Hg)	Copper (Cu)	Nickel (Ni)	Lead (Pb)	Zinc (Zn)	Polychlorinated biphenyls (PCBs) (total) (PCB 28, 52, 101, 118, 138, 153 and 180)	Anthracene	Benzo (a) anthracene	Benzo (a) pyrene	Chrysene	Phenanthrene	Indeno (1,2,3-cd) pyrene	Fluoranthene	Naphthalene	Benzo (g, h, i) perylene	Benzo (k) fluoranthene	PAHs (total)	Mineral oils	DDT (total)	Cyclodil pestocides	HCH (total)	Alpha-endosulfane	Heptachlor	Heptachlor epoxide	Total organic carbon (TOC)	
			%												mg/kg												µg/kg	mg/kg	%						
			Limit values for the sediment quality assessment for dredging of sediment from the watercourse (Annex 3, Table 2 of Regulation)																																
			MDK 4	/	/	29	6.3	194	6.7	82	63	317	268	1	40	/	/	/	/	/	/	/	/	5000	4000	4000	2000	4000	4000	4000	/	/	/	/	
			MDK 3	/	/	29	3.9	194	1.1	39	14	317	268	0.2	10	/	/	/	/	/	/	/	/	3000	40	/	/	/	/	/	/	/	/	/	/
			MDK 2	/	/	29	1	194	0.33	16	11	317	178	/	1	/	/	/	/	/	/	/	/	1000	10	/	/	/	/	/	/	/	/	/	/
			MDK 1	/	/	15	0.4	51	0.2	16	11	51	52	0.02	1	/	/	/	/	/	/	/	50	10	5	10	0.01	0.7	0.002	/	/	/	/	/	
			Limit values for the status and trend of sediment quality assessment (Annex 3, Table 1 of Regulation)																																
			Remed. Value	/	/	55	12	380	10	190	210	530	720	1									40	5000	4000	4000	2000	4000	4000	4000					
			MDK	/	/	42	6.4	240	1.6	110	44	310	430	200	0.1	0.4	3	11	0.5	6	3	0.1	8	2	10	3000		1	68	0.002					
			Target value	/	/	29	0.8	100	0.3	36	35	85	140	20	0.001	0.003	0.003	0.1	0.005	0.06	0.03	0.001	0.08	0.02	1	50	10	5	10	0.01	0.7	2E-04			
Preliv	PREL SM	Baseline, 2017	78	0.4	2.5	<0.1	6.6	<0.01	2.8	6.7	4.2	23	<0.016	0.07	<0.001	<0.003	<0.003	0.03	<0.001	<0.001	0.01	<0.002	<0.003	0.11	<10	<1.0	<1.0	<1.0	<0.01	<0.70	<0.0002	1523	99	0.8	0.2
	BP1 - PREL	EIA invest, 2012	/	/	3.3	<0.1	11	<0.01	2.8	12	4.2	40	n.d.	n.d.	n.d.	n.d.	n.d.	0.008	n.d.	0.006	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	<10d	<10d	<10d	/	/	/	/
	BP2 - PREL	EIA invest, 2012	/	/	4	<0.1	27	<0.01	15	21	13.4	117	n.d.	0.043	n.d.	n.d.	0.034	n.d.	n.d.	0.063	n.d.	n.d.	0.005	n.d.	n.d.	0	n.d.	0	n.d.	<10d	<10d	/	/	/	/

Sand (2 - 0.05 mm)  
Powder (0.05 - 0.002 mm)  
Clay (<0.002 mm)

# Water and Sediment quality – comparing results

## DOWNSTREAM FROM THE PROJECT AREA



Profile	Code of water body or sampling points	Monitoring system and campaign	VALUE OF THE WATER QUALITY PARAMETERS																									
			General Parameters		Oxygen regime				Nutrients				Salinity				Metals				Organic substances		Microbiological parameters					
			mg/l	mg/l	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	μS/cm	μg/l	μg/l	μg/l	mg/l	mg/l	mg/l	cfu/100	cfu/100	cfu/100	cfu/100 ml	
Zemun	ZEM WR	Baseline, 2017	I	I	I	II	II	III	II	II	III	I	II	I	I	I	I	I	I	I	II	II	IV	III	III	IV		
D6, right	SEPA, 2013	II-IV	III-V	III	I	II	I	I	II	III	II	II	III	I	II	I	I	I	I	I	III	II	II	II	I	I	I	
	SEPA, 2014	II-IV	III-V	II	I	II	III	I	II	III	II	II	II	II	II	I	I	I	I	I	II	II	II	II	III	II	II	II
	SEPA, 2015	II-IV	I-II	III	I	II	II	I	II	III	II	II	II	II	II	I	I	I	I	I	III	II	II	II	II	II	II	II
	SEPA, 2016	II-IV	III-V	II	I	II	III	I	II	III	II	II	II	II	II	I	I	I	I	I	II	II	II	II	I	I	I	I

# Water and Sediment quality – comparing results

## DOWNSTREAM FROM THE PROJECT AREA

												Priority and priority hazardous substances												
												Monitoring system and campaign												
Zemun												Profile												
												Code of water body or sampling points												
												ZEM WR	Baseline, 2017											
												D6, right	SEPA, 2013											
												SEPA, 2014												
												SEPA, 2015												
												SEPA, 2016												

Profile	Code of water body or sampling points	Monitoring system and campaign	MDK AND VALUE OF THE SEDIMENT QUALITY PARAMETERS																																
			MDK		Determination of the dry matter content		Determination of the content of organic matter by loss on ignition		Metal Content						PCBs		Polycyclic aromatic hydrocarbons (PAHs)						Oils		Pesticides				TOC						
			%		Cadmium (Cd)	Chromium (Cr)	Mercury (Hg)	Copper (Cu)	Nickel (Ni)	Lead (Pb)	Zinc (Zn)	Polychlorinated biphenyls (PCBs) (total) (PCB 28, 52, 101, 118, 138, 153 and 180)	Anthracene	Benz(a)anthracene	Benz(a)pyrene	Chrysene	Phenanthrene	Indeno(1,2,3-cd) pyrene	Fluoranthene	Naphthalene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	PAHs (total)	Mineral oils	DDT (total)	Cyclodiol pesticides	HCH (total)	Alpha-endosulfane	Heptachlor	Heptachlor epoxide	Total organic carbon (TOC)				
			Limit values for the sediment quality assessment for dredging of sediment from the watercourse (Annex 3, Table 2 of Regulation)																																
			MDK 4	/	/	29	6.3	194	6.7	82	63	317	268	1	40	/	/	/	/	/	/	/	/	5000	4000	4000	2000	4000	4000	/	/	/			
			MDK 3	/	/	29	3.9	194	1.1	39	14	317	268	0.2	10	/	/	/	/	/	/	/	/	3000	40	/	/	/	/	/	/	/			
			MDK 2	/	/	29	1	194	0.33	16	11	317	178	/	1	/	/	/	/	/	/	/	/	1000	10	/	/	/	/	/	/	/			
			MDK 1	/	/	15	0.4	51	0.2	16	11	51	52	0.02	1	/	/	/	/	/	/	/	/	50	10	5	10	0.01	0.7	0.002	/	/	/		
			Limit values for the status and trend of sediment quality assessment (Annex 3, Table 1 of Regulation)																																
			Remed. Value	/	/	55	12	380	10	190	210	530	720	1										40	5000	4000	4000	2000	4000	4000					
			MDK	/	/	42	6.4	240	1.6	110	44	310	430	200	0.1	0.4	3	11	0.5	6	3	0.1	8	2	10	3000		1	68	0.002					
			Target value	/	/	29	0.8	100	0.3	36	35	85	140	20	0.001	0.003	0.003	0.1	0.005	0.06	0.03	0.001	0.08	0.02	1	50	10	5	10	0.01	0.7	2E-04			
Zemun	ZEM SR	Baseline, 2017	57	4.3	4.9	0.3	35	0.04	25	25	12	80	<0.016	0.02	<0.001	<0.003	<0.003	0.01	<0.001	0.03	0.01	<0.002	<0.003	0.07	<10	<1.0	<1.0	<1.0	<0.01	<0.70	<0.0002	18110	69	21.5	9.5
	D6, right	SEPA, 2012	/	7.54	<12	1	110	0.3	25	85	20	228	<1-2.2	3.3	/	5.6	/	3.6	60.5	<1	2.9	6.3	/	82	<1.0	/	<3.0	/	<1.0	<1.0	22500	/	/	/	

## Field surveys

November 2017

February-March 2018



## **Field surveys**

February – March  
2018



### **Main species description – *Unio crassus***

*Unio crassus* (eng. Thick Shelled River Mussel) is strictly protected species in Serbia and also is included in the European Union list of species of special community interest (92/43/EEC).

In its development, it reaches a size of 35-45 x 40-70 x 20-28 mm.

The armour is dark, most often black, sometimes with green shades, an ellipsoidal shape. It lives in clean waters, on the sandy and rocky bottom of the river.

Lifespan is 20-30 years. Small shells are very sensitive to any pollution of water and need lots of oxygen.

Today *Unio crassus* is before extermination. Water pollution, drying up the puddles and extinction of the parasitized fish have led to the question of the survival of these animals.

Nowadays, it is about putting an end to industrial projects that endanger their habitats.



### **Main species description – *Unio pictorum***

*Unio pictorum* (eng. Painter's Mussel) has name "painting shell" which dates from the time when painters used the shells to mix paints. Variable colors are often greenish-yellow or brown.

There are no very prominent teeth. Sizes 30-40 x 70-100 x 23-28 mm (height), but exceptions are long up to 140 mm.

This species lives in rivers, sometimes can be found in lakes and channels, but mostly in lowlands. *U. pictorum* lives on a sandy surface usually at a depth of 6 m and avoids mud and rocky bottom.

Survival is threatened by water pollution. It is forbidden to extract this kind of shells if they are smaller than 8 cm.



### ***Main species description – *Unio tumidus****

*Unio tumidus* (eng. Swollen River Mussel) has color which vary from brown to greenish with yellow shades.

The dimensions of this shell are 25-40 x 50-80 x 23-35 mm (height). Some specimens are up to 120 mm.

This species lives in slow rivers, sleeves and lakes. It is also in artificial lakes and ponds and prefer sandy bottom and slowly moving water.

*U. tumidus* lives up to 9 m depth and avoids rocky areas and silts; also, requires cleaner water that has plenty of oxygen, compared to other types of shellfish.

Today this species is before extinction because it is threatened by water pollution, as well as man.



### **Main species description – *Limosella aquatica***

*Limosella aquatica* (eng. Water Mudwort) is a widespread species of flowering plants in the figwort family native to much of the temperate world where it grows in many types of wet habitat.

This is characteristic and very typical plant of the exposed mud on the draw-down zones of lakes and reservoirs, silt bars and banks in rivers, wet tracks and temporary pools, shallow still or slowly flowing waters, muddy or sandy shorelines, areas with fluctuating water levels and lakeshores subject to daily water level fluctuations.

It is usually associated with nutrient-rich sites or soils with high organic content. *L. aquatica* is semiaquatic and partly submersed or floating in the water, fleshy annual herb forming low tufts in muddy substrate.



### **Main species description – *Acipenser ruthenus***

*Acipenser ruthenus* (eng. Sterlet) may reach 16 kg in weight and 100 to 125 cm in length.

This species is quite variable in coloration, but usually has a yellowish ventral side. It is distinguishable from other European species of sturgeons by the presence of a great number of whitish lateral scutes, fringed barbels and an elongated and narrow snout, highly variable in length.

Spawning occurs from the middle of April to the beginning of June. Females may lay from 15.000–44.000 eggs, at water temperatures preferably in range 12–17 °C.

Sterlets require relatively large ponds with good water conditions and may be entangled in plants such as blanket weed.

*Acipenser ruthenus* represent a smallest species from family Acipenseridae in Danube River. In Danube, it is breeding during the April and May, on 8-19 °C, until 10 m.



This species is protected in Serbia and is protected by CITES (Appendix II).

### **Main species description – *Charadrius dubius***

*Charadrius dubius* (eng. Little Ringed Plover) is a small bird. Adult have gray-brown back and wings, white belly and white breasts with black ribbon on the neck.

Their habitats are open gravel near to freshwater lakes, including recesses (holes, slopes) in them, river islands and riverbanks.

They nest on the ground, between stones with little or no vegetation. Nesting pairs have also been recorded on flat graveled roof. The nest is a shallow scrape on loose sand, dry mud or on flat, bare rocks surrounded by mud or sand, sometimes amongst sparse vegetation in the vicinity of water, and often on small islands or adjacent farmland.

During the incubation period both male and female take turns incubating the eggs. *Charadrius dubius* search for food on mud or sludge surfaces, usually in their close surroundings and by sight.



### ***Main species description – Riparia riparia***

*Riparia riparia* (eng. Sand martin) is a small, slender bird with long wings, a slightly notched tail and a distinctive dark band across the breast.

Sand martins may feed alone or in large flocks, usually over water or open ground, and often associate with other swallow species.

The breeding season of the sand martin runs between April and August. It is a highly social species, nesting in colonies that may number from 10 to nearly 2.000 pairs.

The sand martin nests in burrows, which are typically crowded together in a natural or artificial bank, usually in fairly loose soils that are easy to burrow into, and near large bodies of water that give plenty of flying space. The burrows are mostly built in the upper part of the bank, to avoid ground predators..



## Main species - Status

- ✓ River Mussel *Unio crassus* declined during the 20<sup>th</sup> century everywhere in Europe due to deteriorating water quality, habitat fragmentation and host fish limitation.
- ✓ This species is strictly protected in Serbia by the Rulebook on the proclamation and protection of strictly protected and protected wild plant, animal and fungi species, "The Official Gazette of the Republic of Serbia" No. 5/2010 and 47/2011
- ✓ According to IUCN Red list, it is endangered species and it is included in the European Union list of species of special community interest (92/43/EEC). According to the IUCN Red list, *U. tumidus* and *U. pictorum* are Least Concern species.
- ✓ Plant *Limosella aquatica* lives on sandy and gravel islets, as they exists on critical sectors on Danube River.
- ✓ Populations of this plant on critical sectors are important on the national level and, according to previously mentioned rulebook, it is a protected species in Serbia.
- ✓ According to the IUCN Red list, it is a Least Concern species.



*U. pictorum*



*U. tumidus*



*U. crassus*



## Main species Status

- ✓ Fish *Acipenser ruthenus* is, according to the IUCN Red list, vulnerable species. According to previously mentioned rulebook, it is protected in Serbia and is protected by CITES (Appendix II).



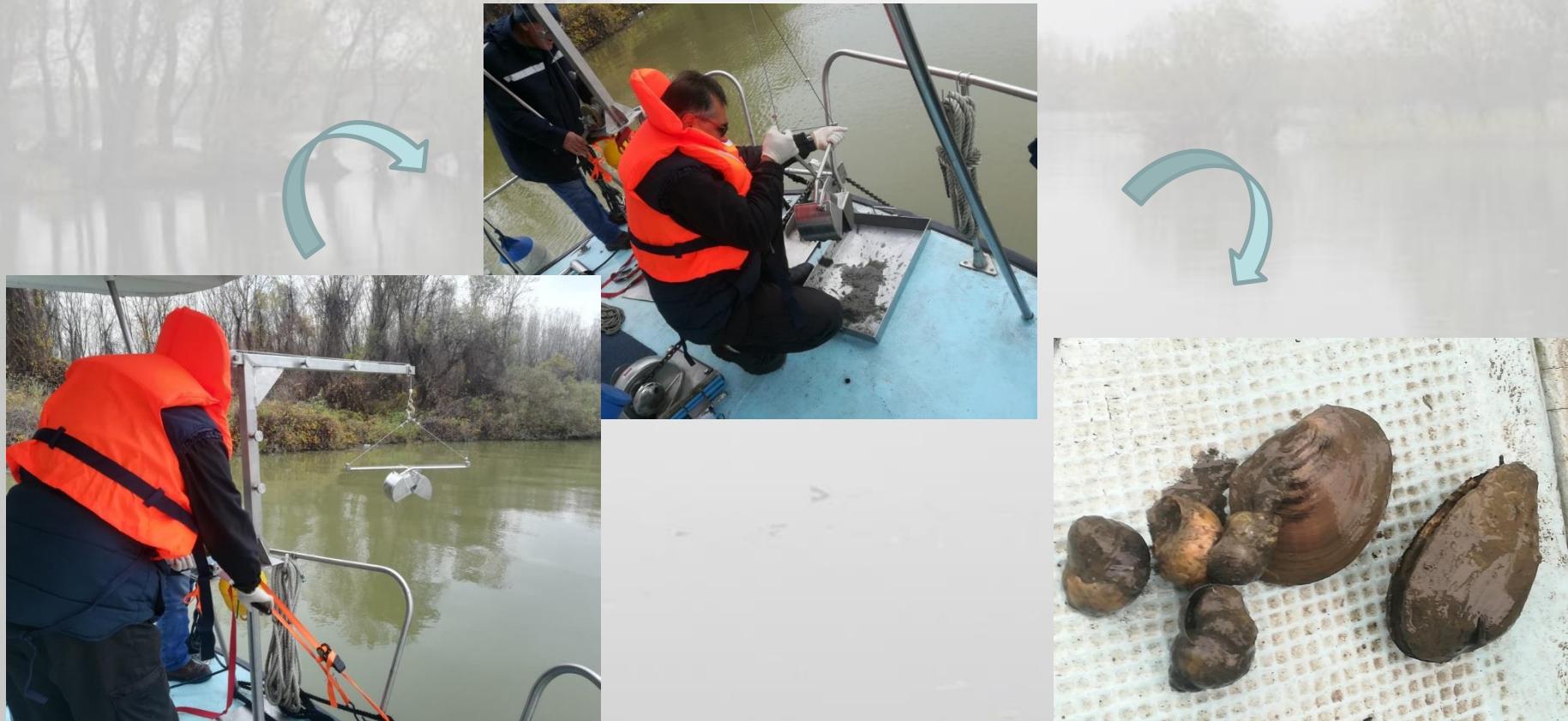
- ✓ Bird *Charadrius dubius* in Europe has a trend of a mild decline in population number. According to previously mentioned rulebook is strictly protected species in Serbia, where their population is also in decline, and is protected by the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention).
- ✓ According to the IUCN Red list, it is a Least Concern species

Bird *Riparia riparia* according to the IUCN Red list is a Least concern species and according to domestic regulation is strictly protected. Their population in Serbia is in mild decline



## **Methodology – mussels**

Samples were taken by using stainless steel “hand bucket” (on the motor boat) up to 7 m depths from water sediment. After getting out of the water, samples were partially dried in order to reduce the mass of the sediment, after which mussel individuals were separated and identified.



### **Methodology** – plants

Phytocenological records have been implemented according to Braun-Blanquet methodology and LEAFPACS protocol. Semiaquatic records has been taken according to LEAFPACS field protocol (Willby *et. al.*, 2009; Gunn *et al.*, 2010), in the line with Pan European standard for sampling macrophytic vegetation (15460: 2007 Water quality-Guidance standard for the surveying of macrophytes) (CEN, 2007).

According to field procedure, a tour of entire river habitat along the river bank in order to get insight in diversity and distribution of *Limosella aquatica* has been performed. In line with results of field tour, representative 100 m along sectors has been selected within which recording has been performed. Along the 100 m sector, on every 20 m record has been taken in area of 1-9 m<sup>2</sup> on depths from 25, 50 and >75 cm.

### ***Methodology – fishes***

For the estimation of the fish fauna, networks of 10 x 3 m and fine mesh (30 mm) are used. Five sets are made in the riparian zone of the River, comprising an approximate area of 150 m<sup>2</sup>. The section of the habitat where this type of fishing is applied are vary depending on the size of the habitat. The sampling efforts are measured in seconds (maximum 1000). At the same time, geographic (coordinates), ecological and physical and chemical characteristics of existing aquatic environments (including photographic records) are recorded.

Maintenance of networks at the desired level of water is made possible by domination buoys over weights or vice versa. Standing nets can be single-layer or three-layer interlocking meshes. Nets were thrown to the bottom and they stood there for a day. Nets then were taken out, Sterlet was counted and after that all individuals has been returned to the water.

### ***Methodology*** – birds

Line transects involve the observer continually walking and recording all contacts either side of the track walked. In order to identify more and more common types of an area, it is necessary to allocate a certain number of transects per field, bearing in mind that different dwellings are approximately equally present.

Transects 100 m long in rich bird areas can be chosen, up to 1000 m in poor areas. It is important that the transects are sufficiently distant from each other (at least 150-200 m) so that the birds that were disturbed in the first one will not be counted again in the second, and that each transect will be covered at about the same speed at approximately the same time.

If it is necessary to estimate the population density per unit of area of a particular habitat, it is important to limit the recording of birds only to those observed within a certain distance, for example, all birds that are seen/heard within a 50 m wide strip left and right form the route are recorded in a kind, gender and age. In open habitats, birds can be record inside, for example, bands 100 m wide, 50 m to the left and right of the viewer; that is, continue to record all observed birds, but with the indication whether it is in or out of the transect.

### Results – mussels

*Unio* sp. – During the field survey carried out in November 2017, February and March 2018, one individual downstream of the critical sector Preliv and two on the sector Susek were found.

In addition, some species from non-target genera were also found. Slightly downstream of the critical sector Preliv, *Corbicula* sp. (two individuals), *Dreissena polymorpha* (five) and *Sinanodonta woodiana* (two) were found in Zemun's part of the Danube. On the sector Beška, *Sinanodonta woodiana* (one) and *Corbicula* sp. (around 50 individuals) were found. On the sector Susek, *Sinanodonta woodiana* (one individual), dozens of *Dreissena polymorpha* and couple of *Dreissena rostriformis bugensis* were found.



### **Results – *Limosella aquatica***

Two individuals of this semiaquatic plant were found in the wider area of the critical sector Čortanovci, in the Koviljsko-Petrovaradinski rit.



### **Results – *Acipenser ruthenus***

Five individuals of *Acipenser ruthenus* were found on the sector Preliv and four on the sector Beška.

Species from non-targeted fish genera were also found – three individuals of *Perca fluviatilis* (European perch) on the sector Preliv and one individual of *Zingel zingel* (Common zingel) on the sector Beška.



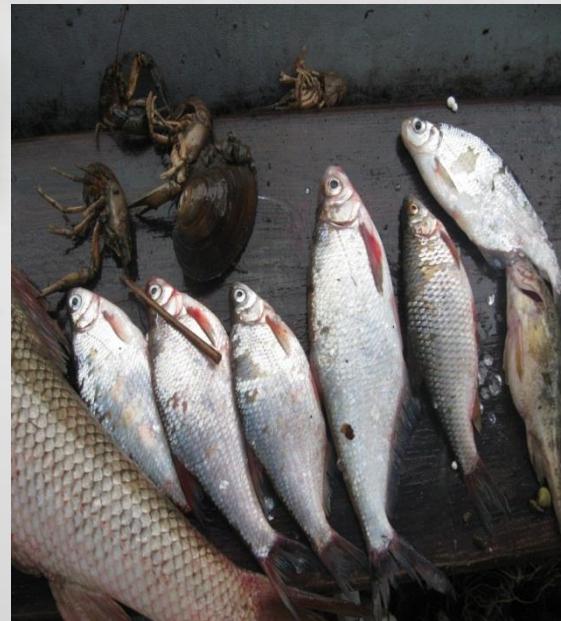
### Results - *Acipenser ruthenus*

On the critical sectors Čortanovci and Arankina Ada no one individual of *Acipenser ruthenus* was found. Species from other genera are: *Rutilus rutilus* (Common Roach) – 2, *Perca fluviatilis* (European Perch) – 2, *Stizostedion lucioperca* (Pike-perch) - 1 and *Aramis bjoerkna* (Silver Bream) – 18.



### Results – *Acipenser ruthenus*

On the critical sector Susek, one individual of *Acipenser ruthenus* was found and no one individual on the sector Futog. Species from non-targeted genera in these two sectors are: *Barbus barbus* (Common Barbel) – 1, *Zingel streber* (Streber) – 4, *Aramis bjoerkna* (Silver Bream) – 8, *Aramis sapa* (White-eye Bream) – 4, *Perca fluviatilis* (European Perch) – 1, *Rutilus rutilus* (Common Roach) – 1, *Lota lota* (Burbot) - 2 and *Chondrostoma nasus* (Common Nase) – 3.



## Results – birds

No one individual of *Charadrius dubius* and *Riparia riparia* has been found.



## Results – Summary

Sector	Mussel ( <i>Unio sp</i> )	Fish ( <i>Acipenser ruthenus</i> )	Plant ( <i>Limosella aquatica</i> )
Susek	2	1	
Futog			
Arankina Ada			
Čortanovci			2
Beška		4	
Preliv	1	5	

A photograph of a misty, foggy landscape. In the foreground, there's a body of water with some ripples. On the left side, there are several bare trees standing in the water. The background is filled with thick fog, obscuring any details further back.

*Thank you for your attention*

