

Interreg-IPA Cross-border Cooperation Programme Romania-Serbia

Academic Environmental Protection Studies on surface water quality in significant cross-border nature reservations Djerdap / Iron Gate national park and Carska Bara special nature reserve, with population awareness raising workshops

= RORS-462 =

PA2.OI3 Studies in the field of environmental protection and emergency management

**STUDY ON SURFACE WATER QUALITY IN DJERDAP/IRON GATE
PROTECTED AREA.**



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5th – 6th February 2021, Timisoara, Romania

8th – 9th February 2021, Bor, Serbia

Danube – Iron Gate / Djerdap area

UNESCO GLOBAL GEOPARKS - one of the 15 unique geoparks in the world



Danube

Danube river, one of the longest rivers in Europe, along its flow makes natural border, and one of the remarkable areas, between Republic of Serbia and Romania - „Iron gate“, the pearl of the Danube river.

National park „Đerdap“

is one of the five national parks and the largest one in Serbia. For the first time it is proclaimed as protected area by the Law on NP „Đerdap“ (Official Gazette of RS, No. 39/1993)

The boundaries of NP „Đerdap“ are established by the Law on National Parks (Official Gazette of RS, No. 84/2015 and 95/2018) where it is defined that it covers area of total 63786,48 ha

The most impressive landmark of this area is certainly gorge “Iron gate” the biggest and one of a kind in Europe, consisting of four smallest gorges and three basins, covering 100km in length and reaching the maximum depth of 170m.

Natural park „Iron Gate“

The Iron Gates is a 115666 ha natural park located in southwestern Romania and bordered for 140 km by the Danube, the second largest natural park in Romania.

For the first time it is proclaimed as protected area by the Law 5/2000 and between 2003 – 2007, 18 particular protected areas under various IUCN classification standards were defined.

Danube

The water sampling campaign was conducted in 17 spots along Danube in programme eligibility area:

14.08.2020 – Liubcova **(D7)**, Berzasca **(D8)**, Cozla **(D9)**, Svinita **(D10)**,
Dubova **(D11)**, Esalnita **(D12)**

24.09.2020 – Bazias **(D1)**, Divic **(D2)**

25.09.2020 – Pojejena **(D3)**

26.09.2020 – Moldova-Noua **(D4)**

27.09.2020 – Coronini **(D5)**, Liborajdea **(D6)**

18.10.2020 – Orsova **(D13)**, Iron Gate I **(D14)**, Drobeta Tr. Severin **(D15)**

19.10.2020 – Ostrovul Corbului **(D16)**, Iron Gate II **(D17)**

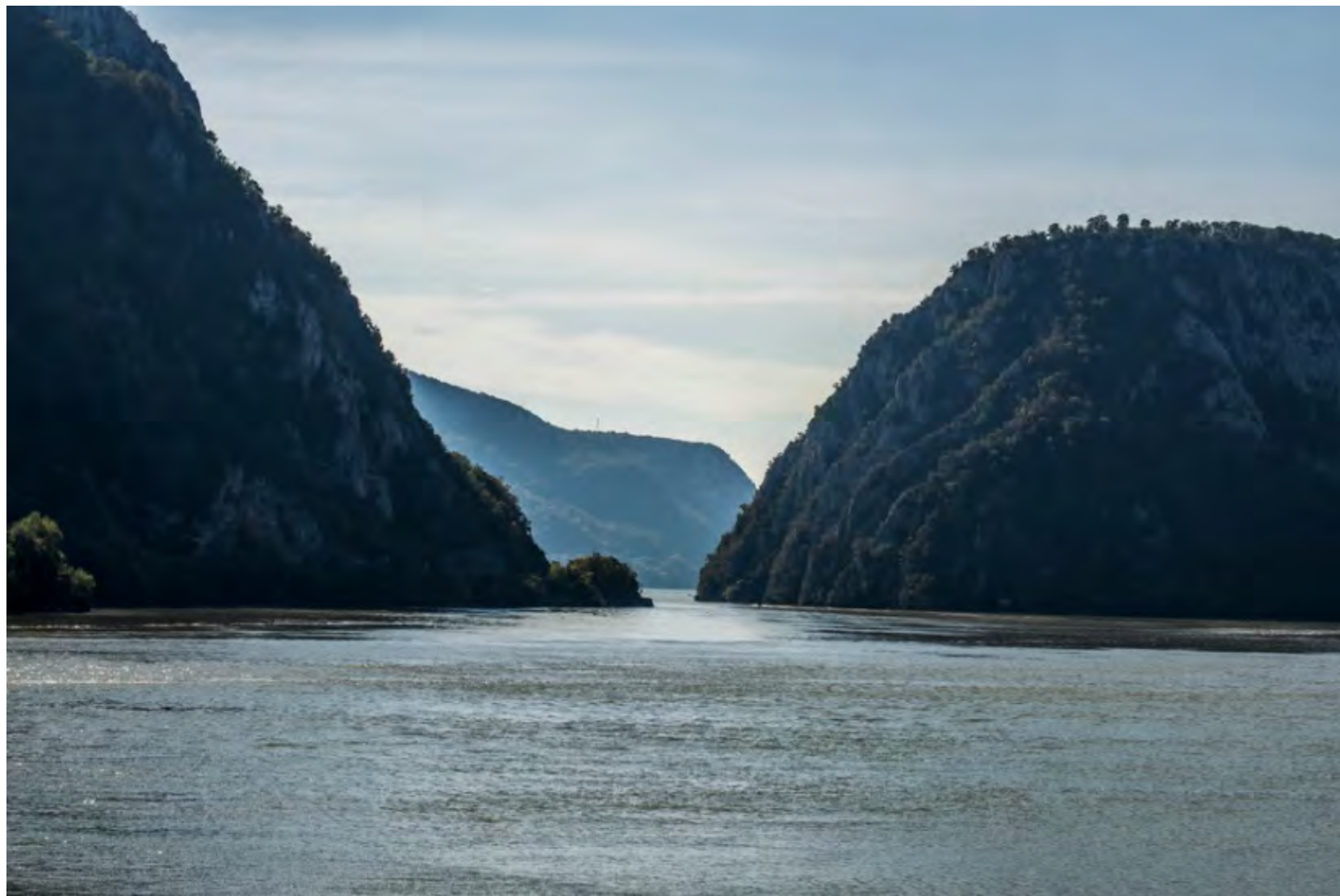
Sampling sites on Danube





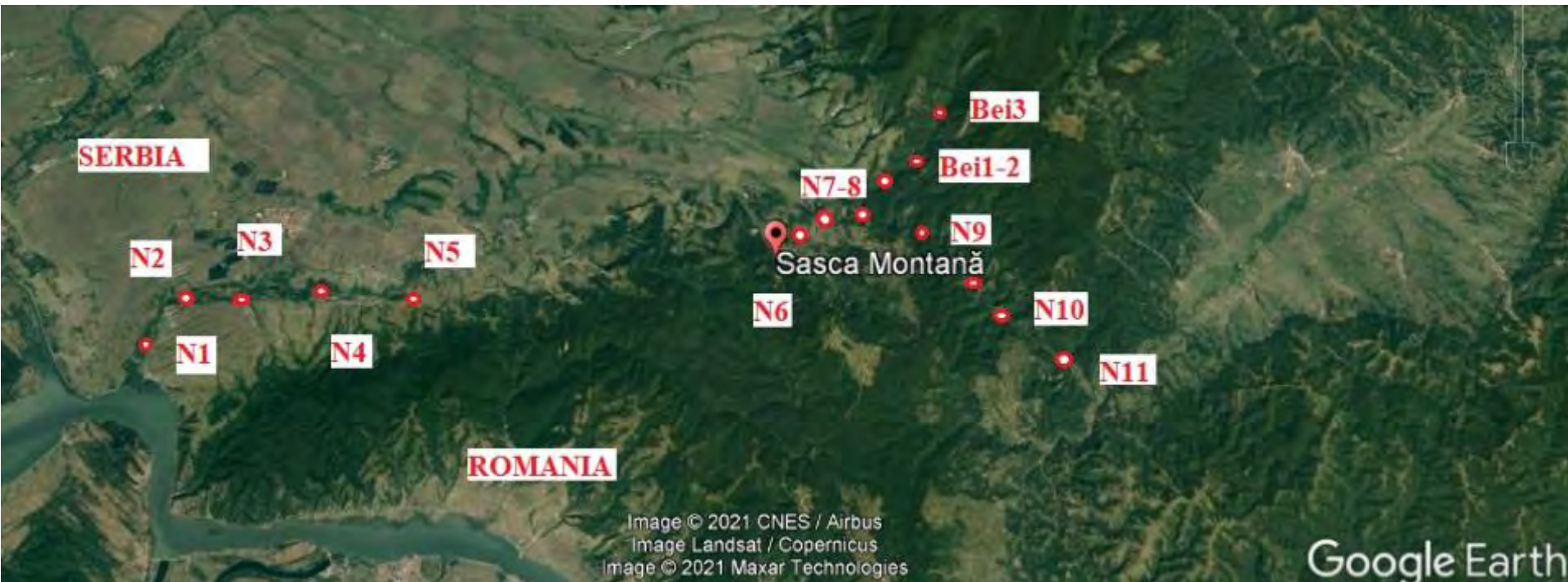








Sampling sites – Danube tributary: **NERA**, 124 km











Sampling sites – Danube tributary: **BERZASCA**, 42 km







Danube tributary: **BERZASCA**



Sampling sites – Danube tributary: **CERNA**, 79 km











Limit values of pollutants in surface waters, Romania

Parameter	Unit	Limit values				
		I class	II class	III class	IV class	V class
pH	-	6.5 – 8.5				
Conductivity	μS/cm	-				
Dissolved oxygen (DO)	mgO ₂ /l	9	7	5	4	< 4
Biochemical oxygen demand (BOD – CBO5)	mgO ₂ /l	3	5	7	20	> 20
Chemical oxygen demand (COD – CCO-Cr)	mgO ₂ /l	10	25	50	125	> 125
Ammonia (NH ₄ ⁻)	mg/l	0.01	0.3	0.06	0.3	> 0.3
Nitrates (NO ₃ ⁻)	mg/l	1	3	5.6	11.2	> 11.2
Nitrites (NO ₂ ⁻)	mg/l	0,01	0,03	0,12	0,3	>0,3
Total Nitrogen (TN)	mg/l	1.5	7	12	16	> 16
Orto phosphate (P-PO ₄ ³⁻)	mg/l	0.1	0.2	0.4	0.9	> 0.9
Sulphates (SO ₄ ²⁻)	mg/l	60	120	250	300	>300
Chloride (Cl ⁻)	mg/l	25	50	250	300	> 300
Sodium (Na ⁺)	mg/l	25	50	100	200	> 200
Calcium (Ca ²⁺)	mg/l	50	100	200	300	> 300
Mercury (Hg)	μg/l	0.1	0.3	0.5	1	> 1
Arsenic (As ₃ ⁺)	μg/l	10	20	50	100	> 100
Lead (Pb)	μg/l	5	10	25	50	> 50
Zinc (Zn ₂ ⁺)	μg/l	100	200	500	1000	> 1000
Cadmium (Cd)	μg/l	0.5	1	2	5	> 5
Manganese (Mn - total)	mg/l	0.05	0.1	0.3	1	> 1
Iron (Fe – total)	mg/l	0.3	0.5	1.0	2	> 2

Physical-chemical parameters measured on surface water

Parameters	Measurement methods
pH	Electrode - electric potential difference
Conductivity	Electrolytic probe
Dissolved oxygen (DO)	Galvanic probe
Biochemical oxygen demand (BOD – CBO5)	
Chemical oxygen demand (COD – CCO-Cr)	Specord 250Plus – photometric method
Ammonia (NH ₄ ⁻)	
Nitrates (NO ₃ ⁻)	
Nitrites (NO ₂ ⁻)	
Total Nitrogen (TN)	Multi N/C 3100. Corrosion-free Focus-Radiation NDIR detection and furnace technology of combustion.
Orto phosphate (P-PO ₄ ³⁻)	
Sulphates (SO ₄ ²⁻)	
Chloride (Cl ⁻)	Specord 250Plus – photometric method
Sodium (Na ⁺)	
Calcium (Ca ²⁺)	
Mercury (Hg)	
Arsenic (As ₃ ⁺)	
Lead (Pb)	
Zinc (Zn ₂ ⁺)	ZEEnit 700 P Compact Tandem Spectrometer. Atomic Absorption Spectrometry – equipped with flame, hydride and graphite furnace, with Zeeman magnetic field control and Deuterium and Zeeman background correction.
Cadmium (Cd)	
Manganese (Mn - total)	
Iron (Fe – total)	

Results obtained for parameter analysis in samples on Danube

Parameter	Unit	Measured values - 5th august 2020					ecological state
		D1 Bazias	D7 Moldova-Noua	D11 Dubova	D16 Ostrovul Corbului	D17 Iron Gate II	
		Summer (08-09)			Autumn (10)		
pH	-	6.9	6.5	6.8	6.7	6.7	-
Conductivity	µS/cm	399	411	403	388	404	-
Dissolved oxygen (DO)	mgO ₂ /l	7.1	7.1	6.5	6.5	6.4	I st -II nd
Biochemical oxygen demand (BOD – CBO5)	mgO ₂ /l	3.6	3.7	3.5	3.3	3.2	II nd
Chemical oxygen demand (COD – CCO-Cr)	mgO ₂ /l	26	25	27	18	18	II nd -III rd
Ammonia (NH ₄ ⁻)	mg/l	0.11	0.16	0.14	0.31	0.33	V th
Nitrates (NO ₃ ⁻)	mg/l	0.77	0.81	0.72	0.68	0.66	I st
Nitrites (NO ₂ ⁻)	mg/l	0.022	0.025	0.028	0.017	0.016	I st
Total Nitrogen (TN)	mg/l	1.21	1.11	1.15	1.01	0.98	I st
Orto phosphate (P-PO ₄ ³⁻)	mg/l	0.31	0.35	0.32	0.21	0.22	III rd
Sulphates (SO ₄ ²⁻)	mg/l	8.3	7.5	8.1	7.2	7.1	I st
Chloride (Cl ⁻)	mg/l	3.5	3.2	3.6	18.5	11.1	I st
Sodium (Na ⁺)	mg/l	2.1	1.9	2.2	3.8	2.9	I st
Calcium (Ca ²⁺)	mg/l	4.5	5.1	4.7	5.1	3.9	I st
Mercury (Hg)	µg/l	0.011	0.011	0.009	0.016	0.015	I st
Arsenic (As ₃ ⁺)	µg/l	0.09	0.11	0.11	0.14	0.14	I st
Lead (Pb)	µg/l	0.21	0.25	0.22	0.28	0.31	I st
Zinc (Zn ₂ ⁺)	µg/l	21.1	17.8	19.1	23.3	18.1	I st
Cadmium (Cd)	µg/l	0.004	0.005	0.008	0.107	0.088	I st
Manganese (Mn - total)	mg/l	0.011	0.011	0.011	0.018	0.012	I st
Iron (Fe – total)	mg/l	0.766	0.891	0.792	1.822	2.193	III rd -V th



Conclusions ?

