



REPORT ON THE MEASUREMENT CAMPAIGN IN THE IRON GATE RESERVOIR

D.6.1.2



PROJECT TITLE

Sediment-quality Information, Monitoring and Assessment System to support transnational co-operation for joint Danube Basin water management.

ACRONYM

SIMONA

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1. INTRODUCTION

The objective of the Sampling campaign in the Iron Gate reservoir was to test, verify and further develop the SIMONA Sampling Protocol. The specific objective is to test and compare various sampling methods (sampling systems) for actual sample collection. The final sampling methods tested and developed and selected for the Protocol were also demonstrated and a training session held during the Training Event. These methods were also used for sample collection at the two National Sampling Points.

A total of 12 sampling sites were sampled during the sampling field campaign. 10 sampling points for WP6 Large lakes and reservoirs, 2 national sampling points and 1 for the purpose of training and demonstration. All of the samples collected from the Iron Gate reservoir were collected from a boat. Suspended sediment samples were also collected.

One originally planned sites had to be replaced by a new site. Table 1 shows the original plan of the 13 sampling sites. Replacement is indicated in the comments column.

Table 1: List of the originally planned sampling sites

Nr.	Name of the site	WGS Long N	WGS Lat E	Owner of water monitoring data	Owner of sediment monitoring data	Responsible for sampling	Existent archive water, sediment monitoring data	Comments
1.	Ledinci	45°13'02.9"	19°48'18.2"	RS-JČWI	SIMONA	RS- JCWI	W	
2.	Novi Sad	45°15'30.8"	19°53'16.4"	SIMONA	SIMONA	RS- JCWI	W, S	
3.	Stari Banovci	44°59'24.9"	20°17'41.3"	SIMONA	SIMONA	RS- JCWI	W, S	
4.	Zemun	44°51'42.0"	20°22'52.7"	SEPA	SIMONA	RS- JCWI	W	Replaced
5.	Ritopek	44°44'25.1"	20°39'30.7"	SIMONA	SIMONA	RS- JCWI	W, S	
6.	Smederevo	44°42'15.0"	20°58'29.9"	SIMONA	SIMONA	RS- JCWI	W, S	-
7.	Ram	44°49'10.7"	21°20'22.5"	SIMONA	SIMONA	RS- JCWI	W, S	New National point
8.	Veliko Gradište	44°46'07.1"	21°31'28.6"	SIMONA	SIMONA	RS- JCWI	W, S	
9.	Donji Milanovac	44°27'56.6"	22°08'09.9"	SIMONA	SIMONA	RS- JCWI	W, S	
10.	Tekija	44°41'05.7"	22°24'25.9"	SIMONA	SIMONA	RS- JCWI	W, S	
11.	Kladovo	44°37'17.2"	22°35'42.1"	SIMONA	SIMONA	RS- JCWI	W, S	
12.	Kusjak	44°19'11.9"	22°32'45.9"	SIMONA	SIMONA	RS- JCWI	W, S	

One national point sampling site (Zemun) was replaced due to the fact that no sediment was present at the time of sampling.



Landscape photo of the sampling site (Zemun).

New national point was chosen at the location near Ram.

Table 2: List of the final sampled sites

Nr.	Sample ID	Name of the river/reservoir	Name of the site	WGS Long, N	WGS Lat, E
1.	WP6_LE_BS	Danube, Iron Gate	Ledinci	45°13'02.9"	19°48'18.2"
2.	WP6_NS_BS	Danube, Iron Gate	Novi Sad	45°15'30.8"	19°53'16.4"
3.	WP6_SB_BS	Danube, Iron Gate	Stari Banovci	44°59'24.9"	20°17'41.3"
4.	WP6_RT_BS	Danube, Iron Gate	Ritopek	44°44'25.1"	20°39'30.7"
5.	WP6_SD_BS	Danube, Iron Gate	Smederevo	44°42'15.0"	20°58'29.9"
6.	WP6_RA_BS	Danube, Iron Gate	Ram	44°49'10.7"	21°20'22.5"
7.	WP6_VG_BS	Danube, Iron Gate	Veliko Gradište	44°46'07.1"	21°31'28.6"
8.	WP6_DM_BS	Danube, Iron Gate	Donji Milanovac	44°27'56.6"	22°08'09.9"
9.	WP6_TE_BS	Danube, Iron Gate	Tekija	44°41'05.7"	22°24'25.9"
10.	WP6_KL_BS	Danube, Iron Gate	Kladovo	44°37'17.2"	22°35'42.1"
11.	WP6_KU_BS	Danube, Iron Gate	Kusjak	44°19'11.9"	22°32'45.9"

Throughout the sampling field activities within the Iron Gate Test Area, and during the entire sampling campaign, constant and constructive discussions were held between all those present about fluvial sediment sampling and long-term Surveillance Monitoring of water bodies under the EU WFD requirements. These ideas, experience gained and some

preliminary suggestions are summarised below. The most fundamental conclusion was that the SIMONA Sampling Protocol provides a solid basis for fluvial sediment sampling and monitoring.

2. DESCRIPTION OF THE SAMPLING METHODOLOGY

(1) **Sample TYPE and Sampling SYSTEM.** The following sample types were collected during the Iron Gate sampling campaign for the purposes of testing various sampling procedures as well as for the purposes of comparison of the results obtained via various sample collection methodologies.

Sample type	Sampling system
Bottom sediment 0-5 cm	gravity core sampler
Bottom sediment 5-10 cm	gravity core sampler
Bottom sediment 10-15 cm	gravity core sampler
Bottom sediment 0 – 15cm	Grab sampler
suspended sediment	Vacuum pump and sampling bottle

(2) All sample types were collected as **composite samples** (suspended sediment is a natural composite so it can be collected at a single location in the flowing stream water).

(3) **Sampling location** selection of the sampling locations within the Iron Gate reservoir was conducted taking into account various factors to ensure that the sampling locations and samples collected from these locations were representative.

(4) **Bottom Sediment:** 5 sub-samples collected from within a 2500 m² square patch ('Sampling section') located at equal distances (50 m). If only a shorter stretch/ smaller patch was accessible only, the distance between sampling points for the sub-samples was smaller.

(5) **Suspended Sediment:** Water from the reservoir was pumped from the water column into a 30 L barrel. Depending on the width of the reservoir at the sampling location, a number of vertical profiles were sampled with that number increasing with an increase in the width of the reservoir.

(6) **Field measurements.** Portable multiparameter probes were used to measure *in-situ* water quality parameters:

- **Water chemistry:** Electroconductivity, T °C, pH, redox potential, dissolved oxygen, turbidity

More specifically Hach HQ40d and YSI ProDSS multiparameter probes were used.



Multiparameter probes used and the measurement of in-situ water quality parameters.



Collection of suspended sediment samples.



Bottom sediment sample collection and sieving in the field.



Bottom sediment sample collection using a gravity corer.

(7) **Field documentation.** Four types of field documentation were performed:

- **Field photos:** First photo taken on the site ID, then each sampling activity and sampling locations were photographed using mobile phones with geo-tagging.
- **Field videos:** Videos were taken on all sampling activities using mobile phones and handheld video cameras.
- **Field sheet:** SIMONA Sampling Protocol field sheets were completed on site.
- **Field notes:** abundant extra notes were taken to document sampling conditions and expert comments and conclusions.

(8) **Sample handling.** Bottom sediment samples and suspended sediment samples were collected into glass jars, suspended sediment samples were collected into 30 L plastic barrels, while stream (bottom) sediment replicate samples (3-5) collected for site homogeneity test were stored in plastic bags. Samples were put into electrically powered sample refrigerators (4-8 C°) immediately after collection on site and transported cooled to the laboratory.





Collected samples in the laboratory

(8) Field safety. Due to the situation with the Covid-19 pandemic special measures were taken to protect all present during the sampling campaign in addition to the safety measures and precautions envisaged by ISO standards.

3. SAMPLING TIMELINE

Date	Temperature	Wind speed	Precipitation	Travelled distance and sampled locations
25-08-2020	16°C– 24°C	0 -30 km/h	Intermittant rainfall	Ledinci
26-08-2020	16°C– 28°C	0 -17 km/h	Intermittant rainfall	Novi Sad
27-08-2020	16°C– 28°C	0 -22 km/h	None	Stari Banovci
30-08-2020	23°C– 35°C	0-28 km/h	None	Ritopek, Smederevo
31-08-2020	20°C– 33°C	0-31 km/h	None	Ram
01-09-2020	17°C– 26°C	0-35 km/h	None	Veliko Gradište
03-09-2020	16°C– 25°C	0-24 km/h	None	Tekija
04-09-2020	15°C– 28°C	0-20 km/h	None	Kladovo
05-09-2020	15°C– 28°C	0-20 km/h	None	Kusjak
09-09-2020	17°C– 30°C	0-19 km/h	None	Donji Milanovac

4. SAMPLING SITES

NAME OF THE SITE: Ledinci

NAME OF THE RIVER: Danube



Sampling profile Ledinci

Field parameters	Unit	Surface water
Temperature	°C	23.7
pH		7.88
Electrical Conductivity	µS/cm	334.8
Turbidity (measured)	NTU	16.2
Dissolved Oxygen; DO	mg/l	7.35
Oxygen Saturation; DO	%	77.5

NAME OF THE SITE: Novi Sad
NAME OF THE RIVER: Danube



Sampling profile Novi Sad

Field parameters	Unit	Surface water
Temperature	°C	23.7
pH		7.89
Electrical Conductivity	µS/cm	334
Turbidity (measured)	NTU	16.1
Dissolved Oxygen; DO	mg/l	7.3
Oxygen Saturation; DO	%	86.9

NAME OF THE SITE: Stari Banovci

NAME OF THE RIVER: Danube



Sampling profile Stari Banovci

Field parameters	Unit	Surface water
Temperature	°C	23.7
pH		7.94
Electrical Conductivity	µS/cm	337.7
Turbidity (measured)	NTU	11
Dissolved Oxygen; DO	mg/l	7.57
Oxygen Saturation; DO	%	90.3

NAME OF THE SITE: Ritopek
NAME OF THE RIVER: Danube



Sampling profile Ritopek

Field parameters	Unit	Surface water
Temperature	°C	24.0
pH		7.82
Electrical Conductivity	µS/cm	352
Turbidity (measured)	NTU	10.1
Dissolved Oxygen; DO	mg/l	6.57
Oxygen Saturation; DO	%	79.4

NAME OF THE SITE: Smederevo
NAME OF THE RIVER: Danube



Sampling profile Smederevo

Field parameters	Unit	Surface water
Temperature	°C	24.2
pH		7.84
Electrical Conductivity	µS/cm	367
Turbidity (measured)	NTU	8.5
Dissolved Oxygen; DO	mg/l	6.59
Oxygen Saturation; DO	%	80

NAME OF THE SITE: Ram

NAME OF THE RIVER: Danube



Sampling profile Ram

Field parameters	Unit	Surface water
Temperature	°C	25.0
pH		7.79
Electrical Conductivity	µS/cm	370.2
Turbidity (measured)	NTU	6.3
Dissolved Oxygen; DO	mg/l	6.6
Oxygen Saturation; DO	%	81.7

NAME OF THE SITE: Veliko Gradište

NAME OF THE RIVER: Danube



Sampling profile Veliko Gradište

Field parameters	Unit	Surface water
Temperature	°C	25.3
pH		7.93
Electrical Conductivity	µS/cm	373.5
Turbidity (measured)	NTU	14
Dissolved Oxygen; DO	mg/l	6.9
Oxygen Saturation; DO	%	88

NAME OF THE SITE: Donji Milanovac

NAME OF THE RIVER: Danube



Sampling profile Donji Milanovac

Field parameters	Unit	Surface water
Temperature	°C	24.1
pH		7.87
Electrical Conductivity	µS/cm	365
Turbidity (measured)	NTU	7.4
Dissolved Oxygen; DO	mg/l	6.94
Oxygen Saturation; DO	%	83.2

NAME OF THE SITE: Tekija
NAME OF THE RIVER: Danube



Sampling profile Tekija

Field parameters	Unit	Surface water
Temperature	°C	24.4
pH		7.83
Electrical Conductivity	µS/cm	358.3
Turbidity (measured)	NTU	4.9
Dissolved Oxygen; DO	mg/l	6.62
Oxygen Saturation; DO	%	8.1

NAME OF THE SITE: Kladovo
NAME OF THE RIVER: Danube



Sampling profile Kladovo

Field parameters	Unit	Surface water
Temperature	°C	23.8
pH		7.82
Electrical Conductivity	µS/cm	360.3
Turbidity (measured)	NTU	5.1
Dissolved Oxygen; DO	mg/l	6.54
Oxygen Saturation; DO	%	77.6

NAME OF THE SITE: Kuskjak
NAME OF THE RIVER: Danube



Sampling profile Kuskjak

Field parameters	Unit	Surface water
Temperature	°C	23.6
pH		7.91
Electrical Conductivity	µS/cm	346.4
Turbidity (measured)	NTU	4.8
Dissolved Oxygen; DO	mg/l	7.1
Oxygen Saturation; DO	%	83.9

ANNEX 1

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