



**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 cooperation for joint Danube Basin water management.

**Acronym**SIMONA

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| For further information on the project, partnership and the Danube Transnational Programme: www.interreg-danube.eu/simona |  |

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# 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 demonstarted 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.

# 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 reuslts 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.

 *A picture containing water, person, outdoor

Description automatically generated*

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

*A picture containing water

Description automatically generated A picture containing person

Description automatically generated*

*Collection of suspended sediment samples.*

*A picture containing water, outdoor, boat, sky

Description automatically generated A picture containing person

Description automatically generated*

*Bottom sediment sample collection and sieving in the field.*

*A picture containing person

Description automatically generated A picture containing water, outdoor, sky, person

Description automatically generated*

*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 samlpe refrigators (4-8 C°) immediately after collection on site and transported cooled to the laboratory.

A picture containing text, table, indoor, wooden

Description automatically generated A picture containing indoor, wall, bathroom, sink

Description automatically generated

A picture containing indoor, lined

Description automatically generated

*Collected sampls 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.

# 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 |

# 

# SAMPLING SITES

**NAME OF THE SITE: Ledinci**

**NAME OF THE RIVER: Danube**

A body of water with trees in the background

Description automatically generated

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**

A body of water with land in the background

Description automatically generated with medium confidence

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**

**A body of water with trees in the background

Description automatically generated**

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**

**A bridge over a body of water

Description automatically generated**

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: Kusjak**

**NAME OF THE RIVER: Danube**



Sampling profile Kusjak

|  |  |  |
| --- | --- | --- |
| **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

**(1) PARTICIPANTS (confirmed)**

1. Marko Marjanović
2. Igor Ljumović
3. Dragan Aleksić
4. Prvoslav Marjanović
5. Dragica Vulić

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