OUTPUT TITLE:

30 EXPERTS TRAINED AT

2. SIMONA TRAINING EVENT

OUTPUT T5.2

PROJECT TITLE:

SEDIMENT-QUALITY INFORMATION, MONITORING AND ASSESSMENT SYSTEM TO SUPPORT TRANSNATIONAL COOPERATION FOR JOINT DANUBE BASIN WATER MANAGEMENT

ACRONYM: SIMONA

PROJECT DURATION:

1ST JUNE 2018 TO 30TH NOV 2021, 42 MONTHS

DATE OF PREPARATION:

01/07/2021

Project co-funded by the European Union (ERDF, IPA and ENI)

AGENDA

For

2nd SIMONA TRAINING EVENT

June 28th, 2021

Hybrid - Online and live from Drustar Hotel for BG-Team and BG national and regional authorities and experts

DTP2-093-2.1 SIMONA - "**S**ediment quality **I**nformation, **Mon**itoring and **A**ssessment System to support transnational cooperation for joint Danube Basin water management"

Project co-funded by the European Union (ERDF, IPA and ENI Contribution)

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INVITATION

Event: SIMONA 2nd Training event

Date: 28th June 2021

Topic: SIMONA Baseline Network Sampling Design - Training

Type: Hybrid - Online and on-site (South Danube TA)

Organizer: dr. Edith Haslinger (AT-AIT)

Contact info:

Edith.Haslinger@ait.ac.at
AIT Austrian Institute of Technology GmbH
Giefinggasse 6 | 1210 Vienna | Austria
T +43 50550-3608 | M +43 664 8251128 | F +43 50550-6390

Description:

Due to the still ongoing Covid-situation all over the world and the resulting travel restrictions, the 2nd SIMONA training event will be in hybrid form: online and onsite (for BG Team, as the event is held back-to-back with the WP8 Workshop for the Bulgarian National, Regional and Local Authorities and experts).

The main objective of the event will be the sampling design for the DRB Baseline Network.

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PROGRAM – SECOND TRAINING EVENT

June 28th, 2021

Hybrid - Online and live from Drustar Hotel for BG-Team and BG national and regional authorities and experts

14:00 – 15:00 Registration of the participants and welcome coffee

15:00 – 15:10 Welcoming *words* by *SIMONA Project Manager Dr. M. Dobnikar* (*via Skype*) *and* Dr. Irena Peytcheva, coordinator of the GI-BAS SIMONA team in Bulgaria

15:10 – 15:25 Presentation on the current status and achievements of the DTP2-093-2.1 SIMONA *(M. Dobnikar)*

15:25 – 15:40 Additional value-added activities of SIMONA (WP 8): Sediment quality evaluation method upgrade and capacity building for uptake *(G. Jordan)*

15:40 – 15:50 Presentation on the "Sediment quality sampling protocol for HSs" (*A. Sorsa*)

15:50 – 16:00 Presentation on SIMONA Field Manual Documents prepared by WP7 experts (*G. Jordan*)

16:00 – 16:10 Presentation on the "Sediment quality laboratory protocol for HSs" (*A. Sorsa*)

16:10 – 16:20 Current status of SIMONA IT tool (*K. Dudas*)

16:20 – 16:30 **Coffee break**

16:30 – 16:50 Sampling design (*G. Jordan*)

16:50 – 17:30 Baseline network sampling and laboratory analyses – Case studies from five countries (RO/BG – *A. Videa, A. Hikov*, Silistra profile; AT – *F. Humer/S. Pfleiderer*, Hainburg and Drava; CZ – *L. Mikl*; HR – *A. Sorsa*)

17:30 – 18:00 Discussion, closing of the on-line session

18.00 – 19.00 (Only on-site in Silistra) Demonstration of bottom and floodplain sediment sampling equipment (*G. Jordan, F. Humer, tbc)*

20.00 - 22.00 (Only on-site in Silistra) Dinner

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SIMONA (Sediment-quality Information, Monitoring and Assessment System to support transnational cooperation for joint Danube Basin water management)

Project Achievements (Period 7)

Kristina Koret,
Geological Survey of Slovenia (LP)

A.7.2 SIMONA 2nd Training event,
28th June 2021, online event

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PROGRAMME PRIORITY & CONSORTIUM

- Environment and Culture Responsible Danube Region Priority Axis (PA 2)

- 17 partners (ERDF, IPA, ENI funds) and 13 associated strategic partners (ASPs) = Danube River Basin, from 14 EU countries

http://www.interreg-danube.eu/about-dtp/participating-countries

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PROJECT IMPLEMENTATION

8 WORKING GROUPS (WGs)

1. Sampling WG
2. Laboratory WG
3. Evaluation WG
4. Reservoir WG

5. Drava WG
6. South Danube WG
7. Upper Tisa WG

8. National Experts WG

8 WORK PACKAGES (WPs):

WP1 – MANAGEMENT

WP2 – COMMUNICATION

WP3 – INVENTORY AND CASE STUDIES

WP4 – SAMPLING AND LABORATORY PROTOCOLS

WP5 – EVALUATION

WP6 – LARGE LAKES AND RESERVOIRS

WP7 – TRAINING

WP8 – SEDIMENT QUALITY EVALUATION METHOD UPGRADE

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PURPOSE OF SIMONA

- Harmonised international sediment **quality** **monitoring** system: the SIMONA system

Hazardous substances (**2013/39/EU Directive**)

Sampling, chemical analysis and evaluation

- DTP countries → lack of institutional supply → SIMONA system: sediment sampling, laboratory analysis and evaluation protocol + IT-tool

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APPROACHES

- ✓ **INVENTORY** – status of SQ monitoring
- ✓ **METHODS** – protocols (sampling, laboratory analysis & evaluation)
- ✓ **TESTING** – 3 test areas (30 sampling sites) + national sites (2 per country -28 sampling sites - DRB Baseline network)
- ✓ **TRAINING** – 3 events to demonstrate SIMONA Sampling and Laboratory protocol in practice + IT-tool Training

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MAIN OUTPUTS

SIMONA System

- **Sampling Protocol**
- **Laboratory Analysis Protocol**
- **Evaluation Protocol**
- **SIMONA Tool** (online IT application) – integrates the 3 protocols. The online platform ensures the transnational information exchange of the sediment quality monitoring and assessment across the DRB.

+ 1 **Guidance document (on Sediment Quality Monitoring in Large Reservoirs)**

+ 4 **Case studies (Test Areas and DRB Baseline Network)**

PROJECT MODIFICATION: EXTENSION & UPGRADE

- **Proposal for 2nd call projects: extension and upgrade**
- **3rd February 2021: approval by the MA/JS**

START DATE	**ORGINAL END DATE**
01.06.2018.	31.05.2021.

NEW END DATE: 30th November 2021

- 6 months extension - all project partners involved
- addition of the **new project period – PERIOD 7 (**01.05. – 30.11.2021**) and new WP – WP8: Sediment quality evaluation method upgrade and capacity (**06 – 11/2021**)**

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Where we are currently? PERIOD 7

Program output indicators	Project main output quantify-cation (target)	Project main output number	Project main output (title)	Delivered
P09 Number of tools for improving transnational water management and flood risk prevention developed and/or implemented	1.00	T1.1.1	Inventory of DRB's sediment monitoring activity	YES
	1.00	T2.1.1	Sediment quality sampling protocol for HSs	YES
	1.00	T2.2.1	Sediment quality laboratory protocol for HSs	YES
	1.00	T3.1.1	Sediment quality evaluation protocol for HSs	IN PROGRESS
	1.00	T3.2.1	SIMONA-tool	IN PROGRESS
	2.00	T4.1.1	Reports on national methods and databases	YES
	1.00	T4.2.1	Guidance on sediment monitoring in large reservoir	IN PROGRESS
	1.00	T5.4.1	Training materials package	IN PROGRESS
	1.00	T6.1	Site-specific sediment quality evaluation guidelines (Manual	NO
P10 Number of pilot actions	1.00	T1.3.1	SIMONA demonstration at 3 test areas	YES
for improving transnational water management and flood risk prevention developed and/or implemented	1.00	T1.4.1	DRB baseline network for HSs sediment monitoring	NO
	1.00	T4.3.1	Demonstration at Iron Gate Reservoir	IN PROGRESS
P07 No. of documented learning interactions in finalised operations	1.00	T1.2.1	40 experts trained at Inventory workshop	YES
	1.00	T1.5.1	40 experts trained at Stakeholder workshop	NO
	1.00	T5.1.1	30 experts trained at 1. SIMONA training event	IN PROGRESS
	1.00	T5.2.1	30 experts trained at 2. SIMONA training event	NO
	1.00	T5.3.1	30 experts trained at 3. SIMONA training event	NO
	1.00	T6.2	Small-group interactive training and workshop events at the premises of PP institutions in each of the 13 participating Danube Countries (onsite or online).	NO

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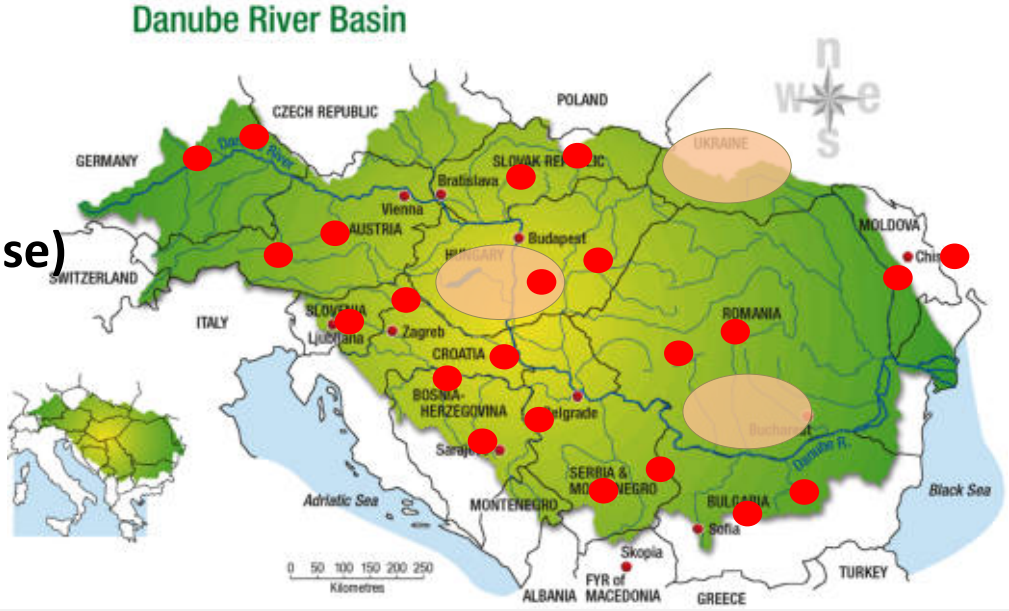
PROJECT MAIN ACHIEVEMENTS

1. Prepared protocols for SEDIMENT sampling and laboratory analysis
2. Test areas sampled and analysed ⟶ 3 CASE STUDIES
3. SIMONA 1st training event (held online 25th March) and 2nd (28th June)
4. FIELD SAMPLING GUIDELINES („cookbook")
5. DRB Baseline sites sampled
6. Evaluation protocol

   (draft, in the development phase)



TEST AREA: 10 sampling sites - site-specific sediment characteristics, representing the various environmental conditions

NATIONAL SITES: EACH COUNTRY - 2 sampling points - DRB Baseline Monitoring Network

PROJECT MAIN ACHIEVEMENTS

1st SIMONA TRAINING EVENT (25th March 2021, online)

REMAINING ACTIVITIES

1. DRB network laboratory analysis
2. WP8 activities – evaluation upgrade
3. Guidance documents and

„Training" for Large Lakes and Reservoirs

4. SIMONA IT tool development and Training (3rd)
5. FINAL Conference (November 2021)

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MAIN PROJECT RESULTS

The main result: Improved, harmonized and coordinated sediment quality monitoring of water body status in the Danube River Basin.

The monitored concentration of Hazardous Substances in sediments, together with passive monitoring, will improve the monitoring strategy of transboundary waters.

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SIMONA Training Event, Silistra, Bulgaria

28 June 2021

Additional value added activities of SIMONA:
Sediment quality evaluation method upgrade and capacity building for uptake

Gyozo Jordan (Scientific Coordinator) & Zsofia Kovacs

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Activity 2 Capacity building:

Presentation, dissemination and integration of the SIMONA project results and upgrades within already existing events and small-group interactive training events in the PP countries

SIMONA Project Upgrade:

Capacity Building

- **2 days small-group interactive training** and workshop events to be held, if possible, **at the premises of PP institutions** in each of the 13 participating **Danube Countries** for the demonstration of sampling techniques from the SIMONA harmonized sampling protocol, as well as presentation of the laboratory protocol and results from the sampling campaigns, and the results of the implementation of the evaluation protocol.

Evaluation Method

Activity 1 Evaluation (risk assessment):

Sediment quality evaluation upgrade in response to end-user demand

DEMAND Effective use of sediment quality assessment for the next RBMPs due in 2021.

Water Framework Directive

WP8 SIMONA Project Upgrade

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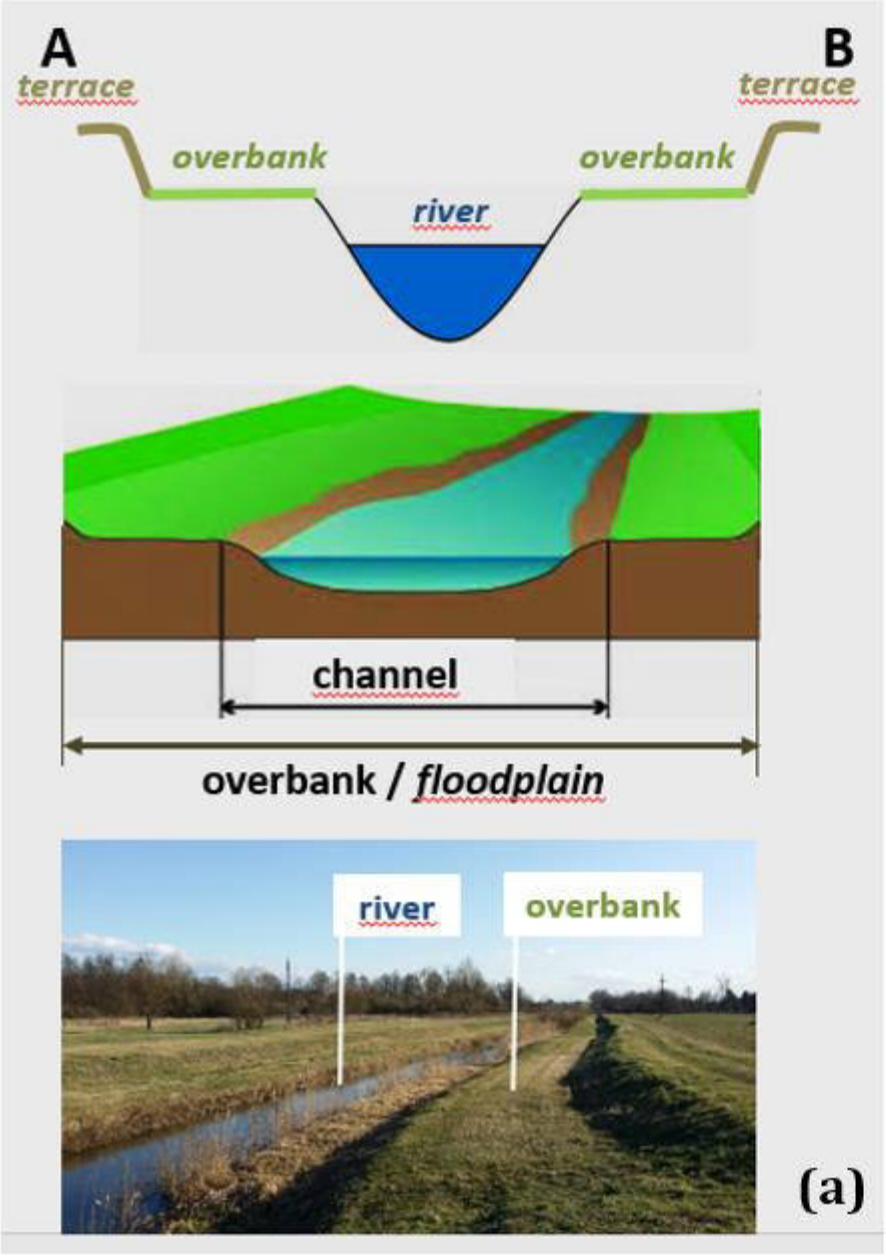

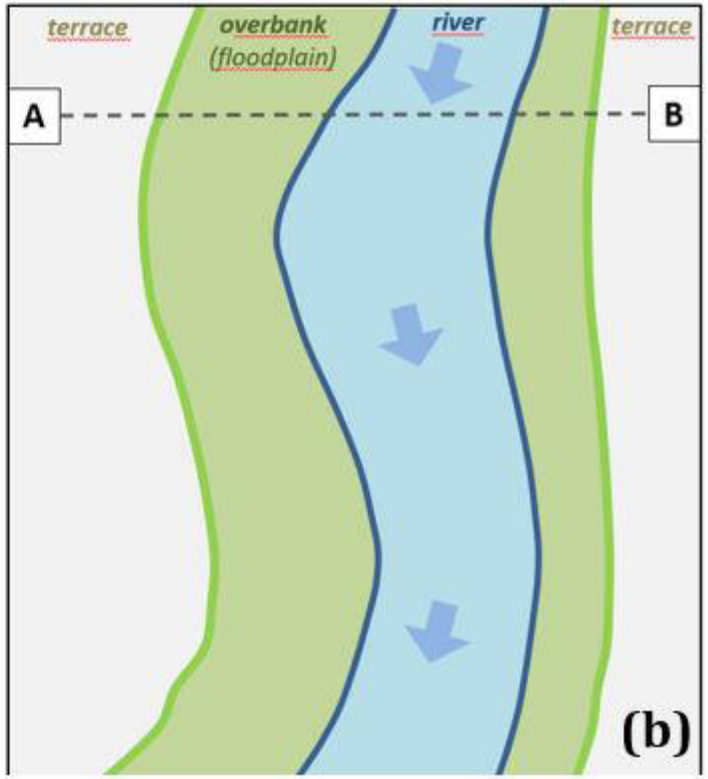

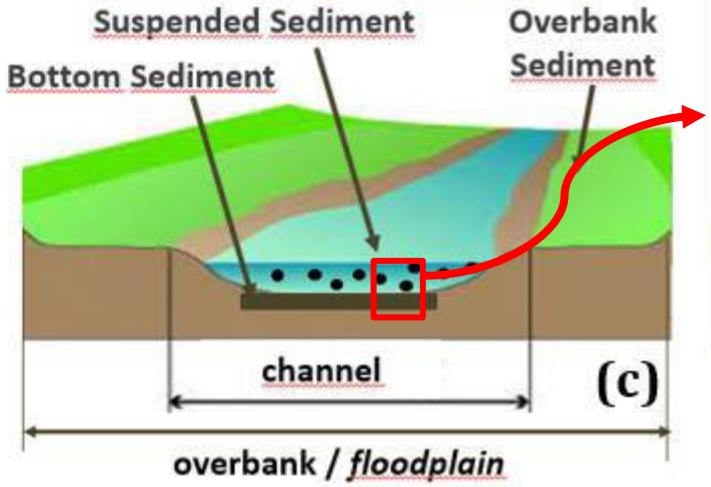

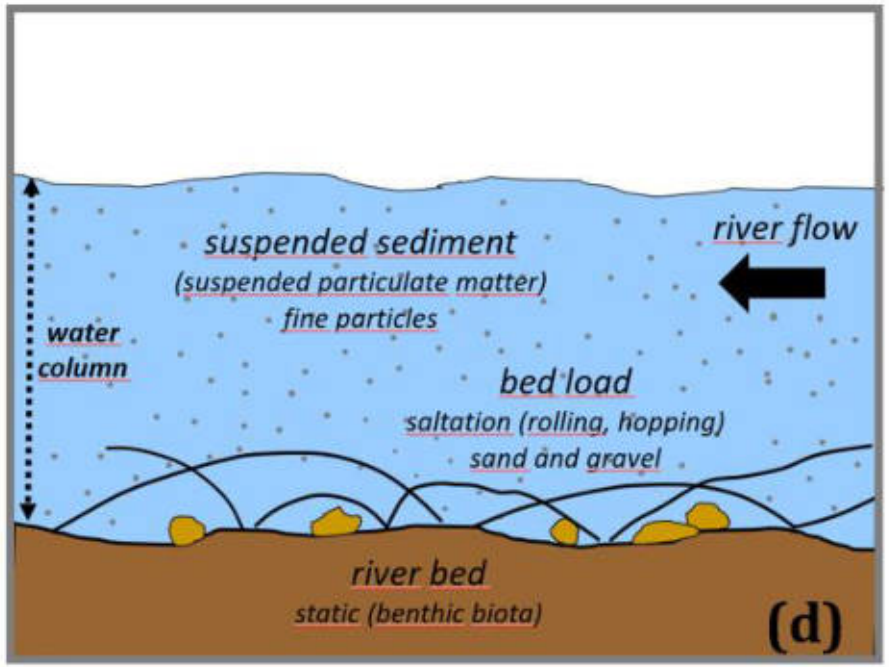

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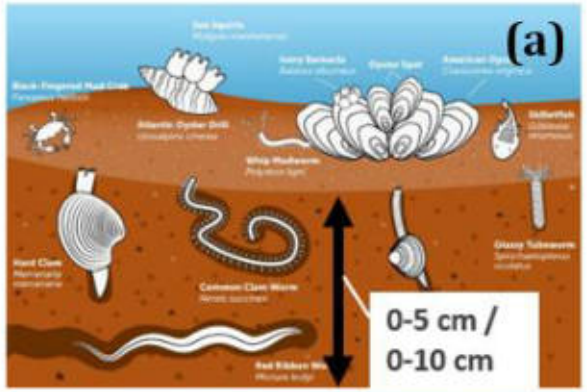
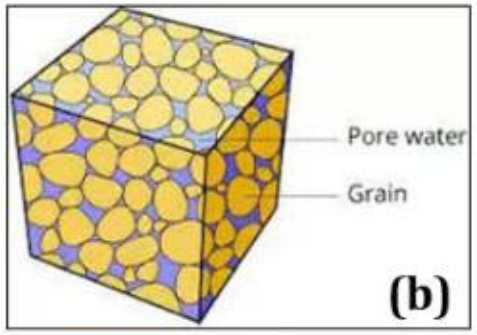
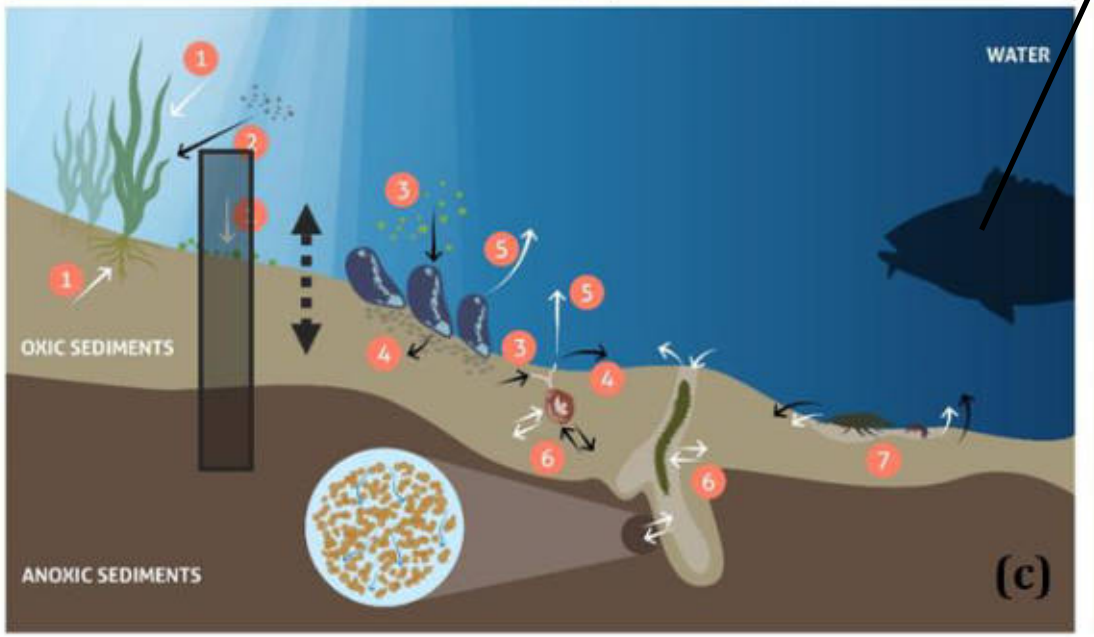
WP8 SIMONA Project Upgrade:

ASSESSMENT ENDPOINT:
Biota







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WP8 SIMONA Project Upgrade:

Currently assessment is based on total concentrations and partitioning coefficients:

$$C_{water,\,total}\left[\frac{mg}{L}\right] = C_{water,\,dissolved}\left[\frac{mg}{L}\right] + C_{susp,\,water}\left[\frac{mg}{L}\right]$$

$$C_{susp,\,solid}\left[\frac{mg}{kg}\right] = K_{p,\,susp}\left[\frac{L}{kg}\right] \cdot \frac{C_{water,total}\left[\frac{mg}{L}\right]}{1 + K_{p,susp}\left[\frac{L}{kg}\right] \cdot C_{SPM}\left[\frac{mg}{L}\right] \cdot 10^{-6}}$$

$$QS_{susp,\,solid}\left[\frac{mg}{kg}\right] = K_{p,\,susp}\left[\frac{L}{kg}\right] \cdot \frac{QS_{water,total}\left[\frac{mg}{L}\right]}{1 + f_{oc,susp} \cdot K_{OC}\left[\frac{L}{kg}\right] \cdot C_{SPM}\left[\frac{mg}{L}\right] \cdot 10^{-6}}$$

$$Kp,\,susp\left[\frac{L}{kg}\right] = \frac{C_{susp,solid}}{C_{water,dissolved}} \frac{\left[\frac{mg}{kg}\right]}{\left[\frac{mg}{L}\right]}$$

$$K_{p,\,susp} = f_{oc,\,susp} \cdot K_{OC}$$

$C_{susp,\,solid} < QS_{susp,\,solid}$

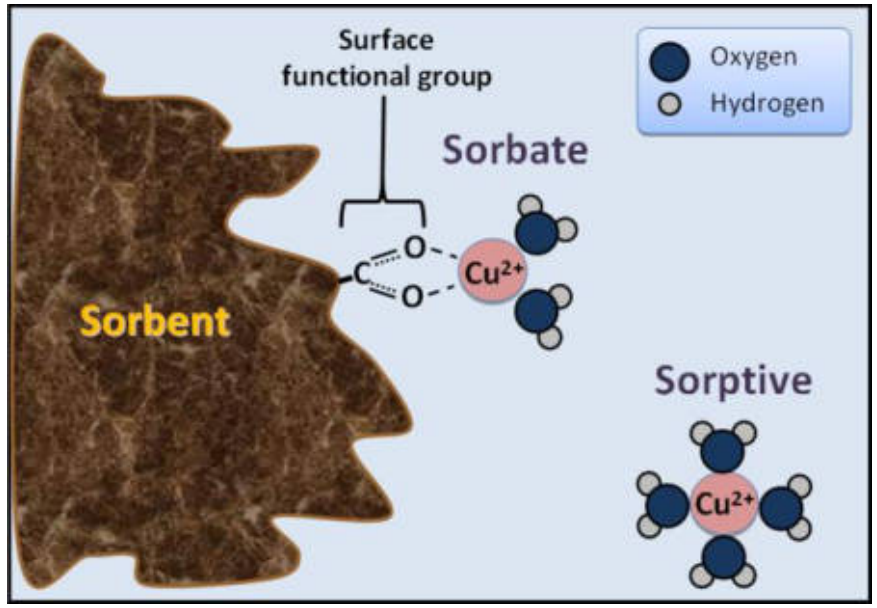
WP8 SIMONA Project Upgrade:

PARTITIONING between solid sediment (Organic Carbon; Clays) and water (Dissolved):

- based laboratory tests (general)
- site specific
- time (conditions, e.g. seasonality) dependent

$$Kp, susp \left[\frac{L}{kg}\right] = \frac{C_{susp,solid}}{C_{water,dissolved}} \frac{\left[\frac{mg}{kg}\right]}{\left[\frac{mg}{L}\right]}$$

$$K_{p,\,susp} = f_{oc,\,susp} \cdot K_{OC}$$



SOLUTION:
- on site monitoring and measurement
- separate observation
- continuous monitoring (passive sampling)

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Transnationally harmonized sediment sampling protocol for HSs in DRB's surface waters

Ajka Šorša, Lidija Galović, Danijel Ivanišević, Ana Čaić Janković, Ivan Mišur
Croatian Geological Survey, (Croatia)

Đorđa Medić, Jasmina Antolić, Neven Bujas
Croatian Waters (Croatia)

Jelena Vićanović, Aleksandra Kovačević
Waters of Srpska (Bosnia and Herzegovina)

HGI 1909
HRVATSKI GEOLOŠKI INSTITUT
CROATIAN GEOLOGICAL SURVEY

HRVATSKE VODE

REPUBLIKA SRPSKA
JAVNA USTANOVA "VODE SRPSKE"

SIMONA 2nd Training Event, 28th June 2021, Hybrid -Online

Project co-funded by the European Union http://www.interreg-danube.eu/approved-projects/simona

Sampling Protocol

(Output 4.1 : Transnationally harmonized sediment sampling protocol for HSs in DRB's surface waters)

February 2019 – October 2019

1. **REVIEW** of current sampling methods for HSs in sediment.

2. **DEVELOPMENT** of transnationally harmonized sediment sampling protocol for HSs.

   Sampling WG Workshop 18th – 19th July 2019, Croatian Geological Survey, Zagreb

3. **CIRCULATION** for comments and ***FINALIZATION*** of the Sampling protocol.

Sediment sampling protocol

Table of Contents

Output 4.1 :*Transnationally harmonized sediment sampling protocol for HSs in DRB's surface waters*

1. Introduction

- The **Water Framework Directive**, the **EQS** Directives (2013/39/EU and 2008/105/EC) and **CIS** Guidance Documents 7, 19, **25** and 27 (EC, 2003, 2007, 2010, 2018);

- **ISO 5667-12:2017** Water quality – Sampling – **Part 12**: Guidance on sampling of **bottom** sediments from rivers, lakes and estuarine areas;
- **ISO 5667-17:2008** Water quality – Sampling – **Part 17**: Guidance on the sampling of bulk **suspended solids** (reviewed and confirmed in 2017);

- **Scientific** knowledge and experience (FOREGS, GEMAS,…)

2. Definition and types of sediments for monitoring

- Stream and bottom sediments are considered as synonyms in this protocol;
- Suspended sediments.

Appendix 1: Recommendations of the SIMONA project: Monitoring active floodplain sediment

3. Selection of compounds to be monitored in sediments

- PHSs listed in **Part A of Annex I** in the Directive 2013/39/EU;
- Additionally, **5 heavy metals** and their compounds List of Priority Substances for the Danube River Basin (**ICPDR**, 2003).

Appendix 2: List of priority Substances and Danube River Basin Specific Pollutants

4. Selection of sediment sampling stations

- ISO standards: ISO 5667-12:2017 for bottom sediments and ISO 5667-17:2008 for suspended sediments prescribed for selection of sampling stations;
- CIS for the WFD, Guidance document No. 25;
- The Trans National Monitoring Network (TNMN) in the Danube River Basin.

5. Sediment collection

5.1. Composite samples

ISO 5667-12:2017 "two or more samples or subsamples mixed together …"

*Recommendations for the SIMONA project: composite samples of stream/bottom sediment should consist of **5-10 subsamples** taken from a 250-500m river segment.*

5. Sediment collection

5.2. Sampling depth

- The thickness of the top layer is variable;
- The sampling depth for the stream/bottom sediment depends on the deposition rate: 0.5 to 1 cm to 5 cm or > 5 cm.

In the CIS Guidance Document No. 25 is suggested: ***"The sampling depth should be defined for each sampling site."***

5.3. Sampling frequency

Recommendation
monitoring stream/bottom and suspended sediment in agreement with

- *WFD and EQS directives,*
- *ISO 5667-12:2017 and ISO 5667-17:2008 standards and;*
- *Surveillance monitoring II in TNMN;*

once per year and every three years for trend monitoring.

5. Sediment collection

5.4. Sample fraction for analysis

- a pre-sampling program to study the sediment in a particular river;
- CIS Guidance Document No. 19 – suggests the <63 µm fraction for metals and the 2 mm fraction for organic contaminants;
- CIS Guidance Document No. 25 - the <63 µm fraction (the clay-silt fraction, widespread in monitoring);

Recommendation: ***the fraction <63 µm***

5.4. Sample volume

Recommendation: ***generally, 1 kg of sediment*** *(e.g., 350 g for organics, 50 g for metals and metalloids, 50-200 g for particle size and other physical properties).*

6. Sampling equipment

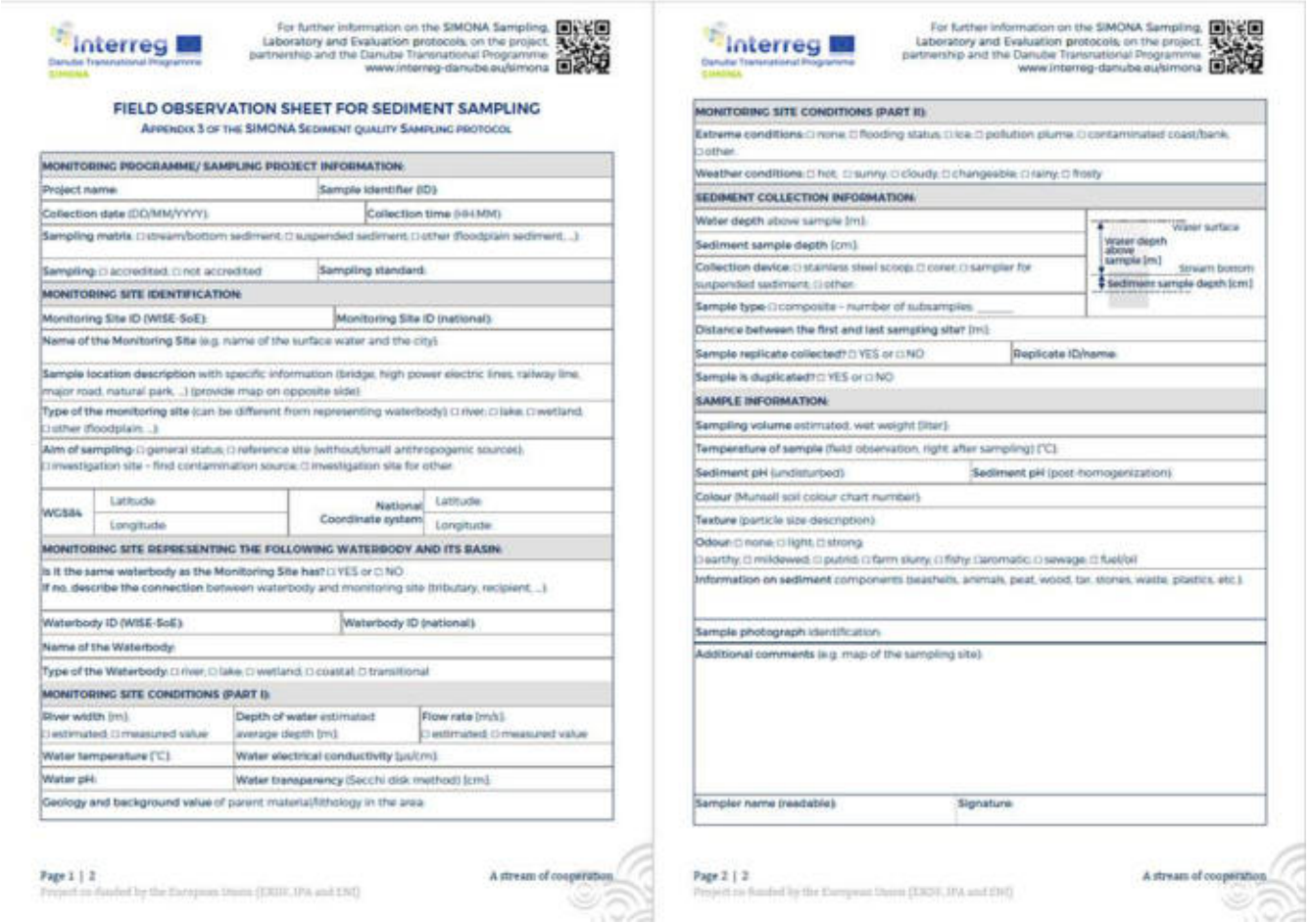
Soil Auger Kit

Sample ring kit model C

Sediment sampling protocol

7. Field observation sheet

Appendix 3: Field observation sheet for sediment sampling



For further information on the SIMONA Sampling, Laboratory and Evaluation protocols, on the project, partnership and the Danube Transnational Programme: www.interreg-danube.eu/simona

FIELD OBSERVATION SHEET FOR SEDIMENT SAMPLING

APPENDIX 3 OF THE SIMONA SEDIMENT QUALITY SAMPLING PROTOCOL

MONITORING PROGRAMME/ SAMPLING PROJECT INFORMATION:

Project name:	Sample identifier (ID):
Collection date (DD/MM/YYYY):	Collection time (HH:MM):
Sampling matrix: ☐ stream/bottom sediment; ☐ suspended sediment; ☐ other (floodplain sediment, ...)	
Sampling: ☐ accredited; ☐ not accredited	Sampling standard:

MONITORING SITE IDENTIFICATION:

Monitoring Site ID (WISE-SoE):	Monitoring Site ID (national):

Name of the Monitoring Site (e.g. name of the surface water and the city):

Sample location description with specific information (bridge, high power electric lines, railway line, major road, natural park, ...) (provide map on opposite side):

Type of the monitoring site (can be different from representing waterbody): ☐ river; ☐ lake; ☐ wetland; ☐ other (floodplain, ...):

Aim of sampling: ☐ general status; ☐ reference site (without/small anthropogenic sources); ☐ investigation site – find contamination source; ☐ investigation site for other:

WGS84:	Latitude:	National Coordinate system:	Latitude:
	Longitude:		Longitude:

MONITORING SITE REPRESENTING THE FOLLOWING WATERBODY AND ITS BASIN:

Is it the same waterbody as the Monitoring Site has? ☐ YES or ☐ NO
If no, describe the connection between waterbody and monitoring site (tributary, recipient, ...):

Waterbody ID (WISE-SoE):	Waterbody ID (national):

Name of the Waterbody:

Type of the Waterbody: ☐ river; ☐ lake; ☐ wetland; ☐ coastal; ☐ transitional

MONITORING SITE CONDITIONS (PART I):

River width (m): ☐ estimated; ☐ measured value:	Depth of water estimated average depth (m):	Flow rate (m/s): ☐ estimated; ☐ measured value:
Water temperature (°C):	Water electrical conductivity (µs/cm):	
Water pH:	Water transparency (Secchi disk method) (cm):	

Geology and background value of parent material/lithology in the area:

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A stream of cooperation

For further information on the SIMONA Sampling, Laboratory and Evaluation protocols, on the project, partnership and the Danube Transnational Programme: www.interreg-danube.eu/simona

MONITORING SITE CONDITIONS (PART II):

Extreme conditions: ☐ none; ☐ flooding status; ☐ ice; ☐ pollution plume; ☐ contaminated coast/bank; ☐ other:

Weather conditions: ☐ hot; ☐ sunny; ☐ cloudy; ☐ changeable; ☐ rainy; ☐ frosty

SEDIMENT COLLECTION INFORMATION:

Water depth above sample (m):	Water surface; Water depth above sample [m]; Stream bottom; Sediment sample depth [cm]
Sediment sample depth (cm):	
Collection device: ☐ stainless steel scoop; ☐ corer; ☐ sampler for suspended sediment; ☐ other:	
Sample type: ☐ composite – number of subsamples: ____	

Distance between the first and last sampling site? (m):

Sample replicate collected? ☐ YES or ☐ NO	Replicate ID/name:
Sample is duplicated? ☐ YES or ☐ NO:	

SAMPLE INFORMATION:

Sampling volume estimated, wet weight (liter):

Temperature of sample (field observation, right after sampling) (°C):

Sediment pH (undisturbed):	Sediment pH (post-homogenization):

Colour (Munsell soil colour chart number):

Texture (particle size description):

Odour: ☐ none; ☐ light; ☐ strong;
☐ earthy; ☐ mildewed; ☐ putrid; ☐ farm slurry; ☐ fishy; ☐ aromatic; ☐ sewage; ☐ fuel/oil

Information on sediment components (seashells, animals, peat, wood, tar, stones, waste, plastics, etc.):

Sample photograph identification:

Additional comments (e.g. map of the sampling site):

Sampler name (readable):	Signature:

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A stream of cooperation

8. Wet–sieving in the field

- Immediately after sampling;
- Use water from the sampling site.

More detail about the sieving procedures is described in the Sediment quality laboratory protocol for HSs within the framework of the SIMONA project.

9. Transport

Samples stored in air-sealed transparent polypropylene bags or bottles should be stored in a refrigerator at a temperature between 2 °C and 8 °C.

10. Quality control

- Field duplicates - throughout investigated area (5-10 %);
- Field replicate - a split of the previously collected sample (5-10 %);
- Field blanks - samples of uncontaminated silica sand sampled using the same sampling equipment and processed as for the sediment sampling (5 %).

11. Safety

- General safety precautions - ISO 5667-1:2006;
- Safe access to sampling sites - ISO 5667-12:2017;
- Local/intern safety measures.

Appendix 1

Recommendations of the SIMONA project: Monitoring active floodplain sediment

"The appropriate monitoring of the HSs in river sediments should take into account ***all types of the sediment****: stream/bottom, floodplain and suspended sediments to* ***comprehensively*** *investigate the sediment-associated HSs."*

"The floodplain sediments suitable for monitoring are deposits of suspended material onto ***active, regularly flooded floodplains*** *and levees along rivers with variable water flow."*

Sediment collection - *mostly in accordance with the* ***FOREGS Atlas*** *(Salminen, 2005).*

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Contacts

- Croatian Geological Survey (Croatia)
  - Ana Čaić Janković acaic@hgi-cgs.hr
  - Ajka Šorša asorsa@hgi-cgs.hr; ajkasorsa@gmail.com
  - Danijel Ivanišević divanisevic@hgi-cgs.hr
  - Ivan Mišur imisur@hgi-cgs.hr
  - Lidija Galović lgalovic@hgi-cgs.hr
- Croatian Waters (Croatia)
  - Đorđa Medić dorda.medic@voda.hr
  - Jasmina Antolić jasmina.antolic@voda.hr
  - Neven Bujas Neven.Bujas@voda.hr
- Waters of Srpska (Bosnia and Herzegovina)
  - Aleksandra Kovačević akovacevic@voders.org
  - Jelena Vićanović jvicanovic@voders.org

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Transnationally harmonized sediment laboratory protocol for HSs in DRB's surface waters

Ana Čaić Janković, Ajka Šorša, Lidija Galović, Danijel Ivanišević, Ivan Mišur
Croatian Geological Survey, (Croatia)

Đorđa Medić, Jasmina Antolić, Neven Bujas
Croatian Waters (Croatia)

Jelena Vićanović, Aleksandra Kovačević
Waters of Srpska (Bosnia and Herzegovina)

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Laboratory Protocol

(Output 4.2 : Transnationally harmonized sediment laboratory analysis protocol for HSs in DRB's surface waters proposal)

February 2019 – October 2019

1. **REVIEW** of current laboratory methods for HSs in sediment.

2. **DEVELOPMENT** of transnationally harmonized sediment laboratory protocol for HSs.

   Laboratory WG Workshop 26th – 27th August 2019, Szent István University, Budapest, Hungary

   (organised by scientific coordinator, Győző Jordán and Laboratory WG leader, prof. Péter Fodor)

3. **CIRCULATION** for comments and ***FINALIZATION*** of the Laboratory protocol.

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The overviews of the laboratory methods and procedures (norms) in DTP countries:

Appendix 1: An overview of the laboratory methods and procedures (norms) for analysis of priority substances (PSs) from **agricultural activities** in DTP countries

Appendix 2: An overview of the laboratory methods and procedures (norms) for analysis of priority substances (PSs) predominantly released from the **industrial activities** in DTP countries

Appendix 3: An overview of the laboratory methods and procedures (norms) for analysis of **heavy metals** and its compounds in DTP countries

Appendix 4: An overview of the laboratory **Quality Control** for analysis of priority substances (PSs) in DTP countries

1. Introduction

The most used method for determination

- heavy metals - Inductively-coupled plasma mass spectrometry (**ICP-MS**);
- organic substances - Liquid chromatography and/or gas chromatography, linked to mass spectrometry (**LC-MS and GC-MS**).

The used method should satisfy the **criteria recommended by WFD** for the HSs:

- they should be determined according the **ISO norms**;
- have a limit of quantification (LOQ) **≤ 30%** Environmental Quality Standard (**EQS**) (or ≤Predicted No Effect Concentration (**PNEC**) for those without established EQSs);
- and a measurement **uncertainty ≤ 50%** (EC, 2018).

1. Introduction

- The **octanol-water partition coefficient** (K_{OW}) is used as a measure of the hydrophobicity of the organic compound (EC, 2010).

  - Compounds with **log K_{ow} > 5** should be measured in sediment or suspended particulate matter (SPM);
  - Compounds with **log K_{ow} <3** should be measured in water;
  - Compounds with a **log K_{ow} between 3 and 5** will depend on the degree of contamination. If the degree of contamination for a hydrophobic compound is unknown or expected to be low, sediment should be an additional monitoring matrix (due to accumulation).

2. Selected substances

- Under the European Water Framework Directive (**WFD**), the Environmental Quality Standards Directive 2008/105/EC was developed which **proposed hazardous substances** for monitoring in sediment.

- The Directive 2013/39/EU amending the Directive 2008/105/EC has proposed **new priority substances** for monitoring and has **changed** the status of some existing PSs.

- Additionally, **5 heavy metals** and their compounds from the List of Priority Substances for the Danube River Basin are included in this (**ICPDR**, 2003).

- **The ISO and/or EPA standards** for chemical analytical methods for the priority substances are described in this protocol.

Sediment laboratory protocol

The **ISO** and/or **EPA** standards for chemical analytical methods for the priority substances are described in this **protocol in paragraphs 2.1. to 2.25.**

2.1. Anthracene
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2.9. Hexachlorocyclohexane
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2.11. Mercury and compounds
2.12. Pentachlorobenzene
2.13. Polyaromatic Hydrocarbons (PAH)
2.14. Tributyltin compounds (Tributyltin-cation)
2.15. Dicofol
2.16. Perfluorooctane sulfonic acid and its derivatives (PFOS)
2.17. Quinoxyfen
2.18. Dioxins and dioxin-like compounds
2.19. Hexabromocyclododecane (HBCDD)
2.20. Heptachlor and heptachlor epoxide
2.21. Nickel and its compounds
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2.24. Chromium and its compounds
2.25. Copper and its compounds

2.13. POLYAROMATIC HYDROCARBONS (PAH)

Polycyclic aromatic hydrocarbons (PAHs, also polyaromatic hydrocarbons) are compounds **consisting** of multiple aromatic rings of carbon and hydrogen. PAHs **occur naturally** in coal, crude oil, and gasoline. They are also **emitted** by burning fossil fuels, waste, and in forest fires. These compounds are **poorly soluble** in water; they therefore predominantly occur in the solid state, bound to particulate air pollution, soils, or sediments.

Human health effects from environmental exposure to low levels of PAHs are unknown. Large amounts of naphthalene in air can irritate the eyes and respiratory tract. Several of the PAHs are considered to be cancer-causing chemicals (Abdel-Shafy and Mansour, 2016).

- **ISO** 13877:1998 Soil quality – Determination of polynuclear aromatic hydrocarbons -- Method using high performance liquid chromatography. International Organization for Standardization.

- **ISO** 17993:2002 Water quality – Determination of 15 polycyclic aromatic hydrocarbons (PAH) in water by HPLC with fluorescence detection after liquid-liquid extraction. International Organization for Standardization.

- **EPA** Method 8100:1986 Polynuclear Aromatic Hydrocarbons. US Government Printing Office, Washington, DC, USA.

- **ISO** 18287:2006 Soil quality – Determination of polycyclic aromatic hydrocarbons (PAH) – Gas chromatographic method with mass spectrometric detection (GC-MS). International Organization for Standardization.

- **EN** 16181:2018 Soil, treated biowaste and sludge – Determination of poly-cyclic aromatic hydrocarbons (PAH) by gas chromatography (GC) and high performance liquid chromatography (HPLC). European Standardisation Organisation.

3. Sieving and drying

- A wet-sieving should be done in the **field** or if not possible in the reference **laboratory**.
- Sample draying at max. temperature **25-30°C** (At temperatures >30°C mercury escapes. Some compounds need freeze drying).
- For a wet sieved sample fraction <63 µm (wet sieving in the field) and for a subsequent analysis of organic compounds, the **freeze-drying** of samples is recommended.
- **Homogenization** of a dried and sieved.
- The reference laboratory divides the homogenized sample into **three parts**: in the reference laboratory, national analysis laboratory and archive.

3. Sieving and drying

- Different **types** of sediments may require different **preparation** (drying, sieving and homogenization) as described in ISO standards:

- ISO 5667-15:2009 **Water quality – Sampling – Part 15**: Guidance on the preservation and handling of sludge and sediment samples (reviewed and confirmed in 2015). International Organization for Standardization.

- ISO 5667-13:2011 **Water quality – Sampling – Part 13**: Guidance on sampling of sludges. International Organization for Standardization.

3. Sieving and drying

- Recommendation **Guidance No. 25** (EC, 2010), all samples must be sieved over 2 mm mesh as soon as possible after collection to remove (large detritus and benthic organisms biotic material will deteriorate and become part of the sediment sample).
- Wet sieving is best performed with **ambient water**.
- Organic analyses - **stainless steel** sieves.
- Trace metals - **polymer** sieves (PVC or acrylic rim, with e.g. nylon or polyester mesh).

4. Sample storage and archive

- The samples store in a **cool** place (usually at 2°C to 8°C);
- For storage for **short** periods (up to 24h), cooling at 2°C to 8°C;
- For sample storage over **longer** periods (more than a month) it is recommended freezing samples at -20°C (HRN **ISO** 5667-12:2001, ISO 5667-12:2017, **ISO** 5667-15:2009 (reviewed and confirmed in 2015)).

- ***All storage methods will affect the sample to some extent, and the choice of preservation technique depends mainly on the objective of the sample collection.***

5. Normalization

Numerous impacts on **bulk sediment composition** influence the reliable interpretation of the laboratory results.

5.1. Grain size correction

Coarser grain fractions dilute the pollution.

5.2. Quartz correction

The high concentration of the quartz fraction in the sample produces a dilution of the existing contaminants which is known as a „matrix effect“.

5.3. Al- and Li-normalization

The content of Al and Li has a significant correlation with heavy metals.

10. Quality control

Start in with **field quality control**:

- Sample **containers** must be cleaned, kept in a clean environment, stored in coolers, use the recommended type of sample container;
- Cigarette smoke, petroleum products can **contaminate** samples;
- Samples must be stored in a **cool** place.

- The laboratory should check during the reception of samples that all the relevant information according **to preservation and transport** conditions of the sample is provided (**ISO 5667-15:2009** -reviewed and confirmed in 2015).

10. Quality control

- **QC** in accordance with ISO/IEC 17025:2017 **General requirements** for the competence of testing and calibration laboratories;
- In **CIS Guidance No. 19** (EC, 2009), Annex III: list of sediment **certified reference materials** (CRM) for the determination of metals, PAHs and chlorinated pesticides in sediment (no CRM developed for other substances);
- Use **control** samples (duplicate samples, laboratory reference materials);
- **Evaluation** of the results using standard statistical methods.
- **Accreditation** for the laboratory/analytical methods according to ISO/IEC 17025:2017.

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SIMONA

Contacts

- Croatian Geological Survey (Croatia)
  - Ana Čaić Janković acaic@hgi-cgs.hr
  - Ajka Šorša asorsa@hgi-cgs.hr; ajkasorsa@gmail.com
  - Danijel Ivanišević divanisevic@hgi-cgs.hr
  - Ivan Mišur imisur@hgi-cgs.hr
  - Lidija Galović lgalovic@hgi-cgs.hr
- Croatian Waters (Croatia)
  - Đorđa Medić dorda.medic@voda.hr
  - Jasmina Antolić jasmina.antolic@voda.hr
  - Neven Bujas Neven.Bujas@voda.hr
- Waters of Srpska (Bosnia and Herzegovina)
  - Aleksandra Kovačević akovacevic@voders.org
  - Jelena Vićanović jvicanovic@voders.org

Interreg
Danube Transnational Programme
SIMONA

HGI 1909
HRVATSKI GEOLOŠKI INSTITUT
CROATIAN GEOLOGICAL SURVEY

HRVATSKE VODE

REPUBLIKA SRPSKA
JAVNA USTANOVA "VODE SRPSKE"

Thank You for Your Attention!

SIMONA 2nd Training Event, 28th June 2021, Hybrid -Online

Project co-funded by the European Union
http://www.interreg-danube.eu/approved-projects/simona

DRAFT

FIELD MANUAL

sampling instructions for the collection of the SIMONA National Sediment Quality Monitoring Baseline Network samples

SAMPLING DESIGN

(Sampling Plan, Sampling Programme)

Gyozo Jordan and Franko Humer

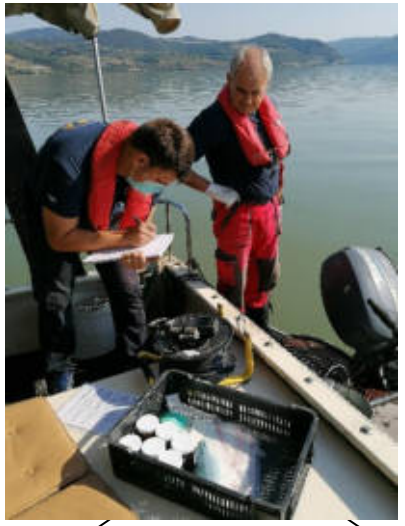
Project co-funded by the European Union
http://www.interreg-danube.eu/approved-projects/simona

SAMPLING CATEGORIES

operational definition

SMALL RIVERS
sampler enters river

LARGE RIVERS
sampling from boat



Bottom Sediment

Suspended Sediment

Overbank Sediment

LOWLAND

ALPINE

LOWLAND

ALPINE

QUESTION: Is my river a **small river** OR a **large river** at the Monitoring Site?

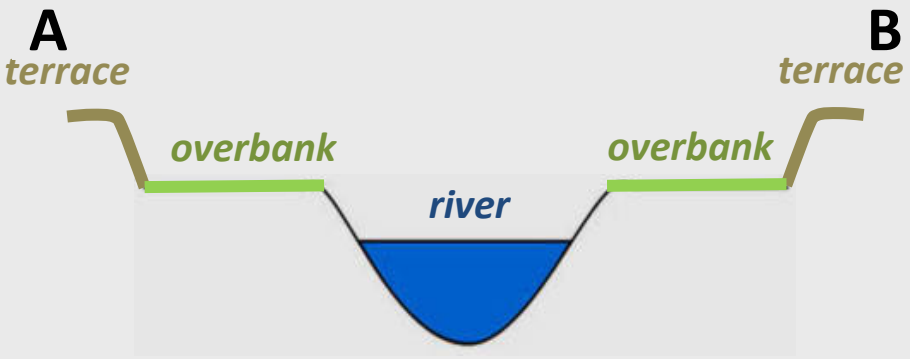
RESPONSE: *Follow the relevant sampling design below.*

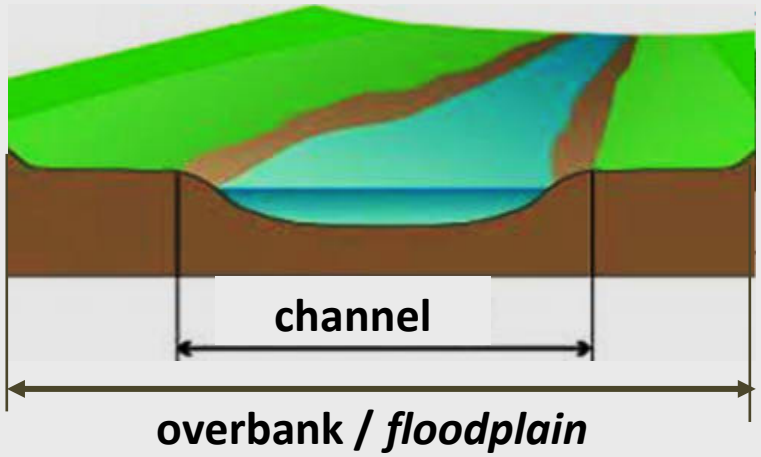
SMALL RIVER

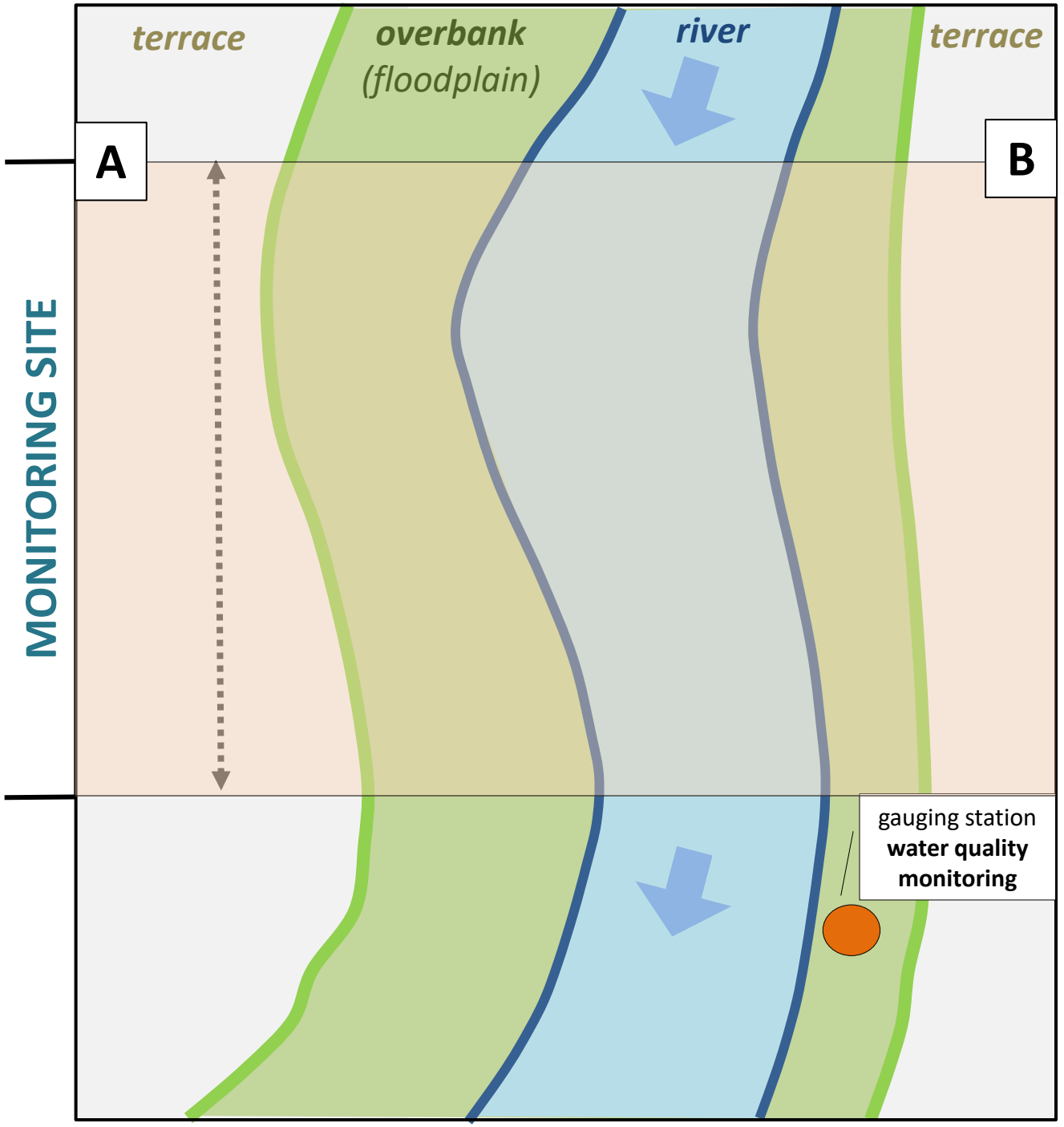
sampler enters river

1. MONITORING SITE LOCATION

1. MONITORING SITE LOCATION

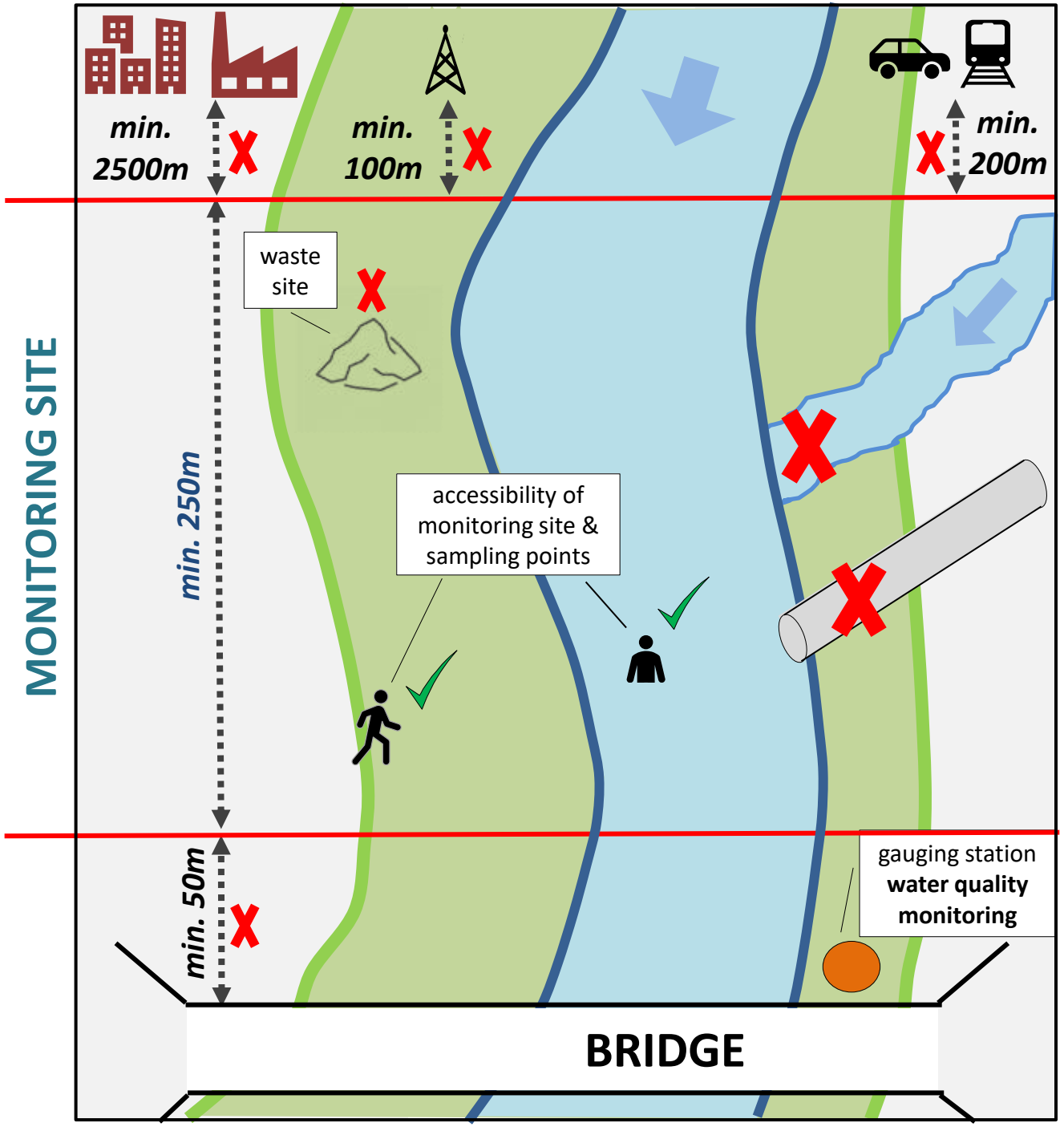






1. MONITORING SITE LOCATION

1. **AT NATIONAL WATER QUALITY MONITORING POINT** *(preferably upstream)*
2. **MIN. 250M LONG**
3. **BOTTOM SEDIMENT, SUSPENDED SEDIMENT, OVERBANK SEDIMENT SAMPLING POSSIBLE** *(availability, accessibility)*
4. **AVOID TRIBUTARY CONFLUENCE**
5. **AVOID KNOWN CONTAMINATED SITE**
6. **AVOID LOCAL CONTAMINATION SOURCE**
   - *Discharge channel or pipe*
   - *Waste site*
   - *Industry or power plant (min. distance 2500m)*
   - *Railway lines & major roads (min. distance 200m)*
   - *Electric line & pylon (min. distance 100m)*
   - *Bridge (min. distance 50m upstream)*
   - *Other sources*
7. **UNIFORM HYDROMORPHOLOGY**



2. SAMPLING POINT LOCATION

2.1 BOTTOM SEDIMENT

HORIZONTAL DESIGN

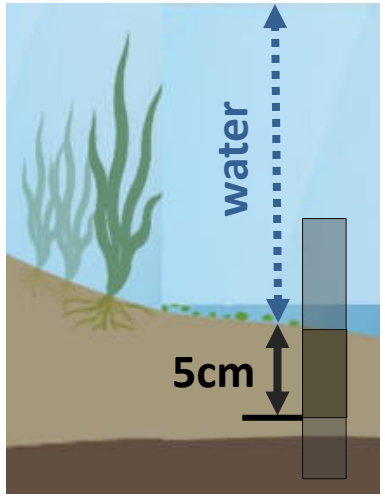
1. **5-10 SAMPLING POINTS**

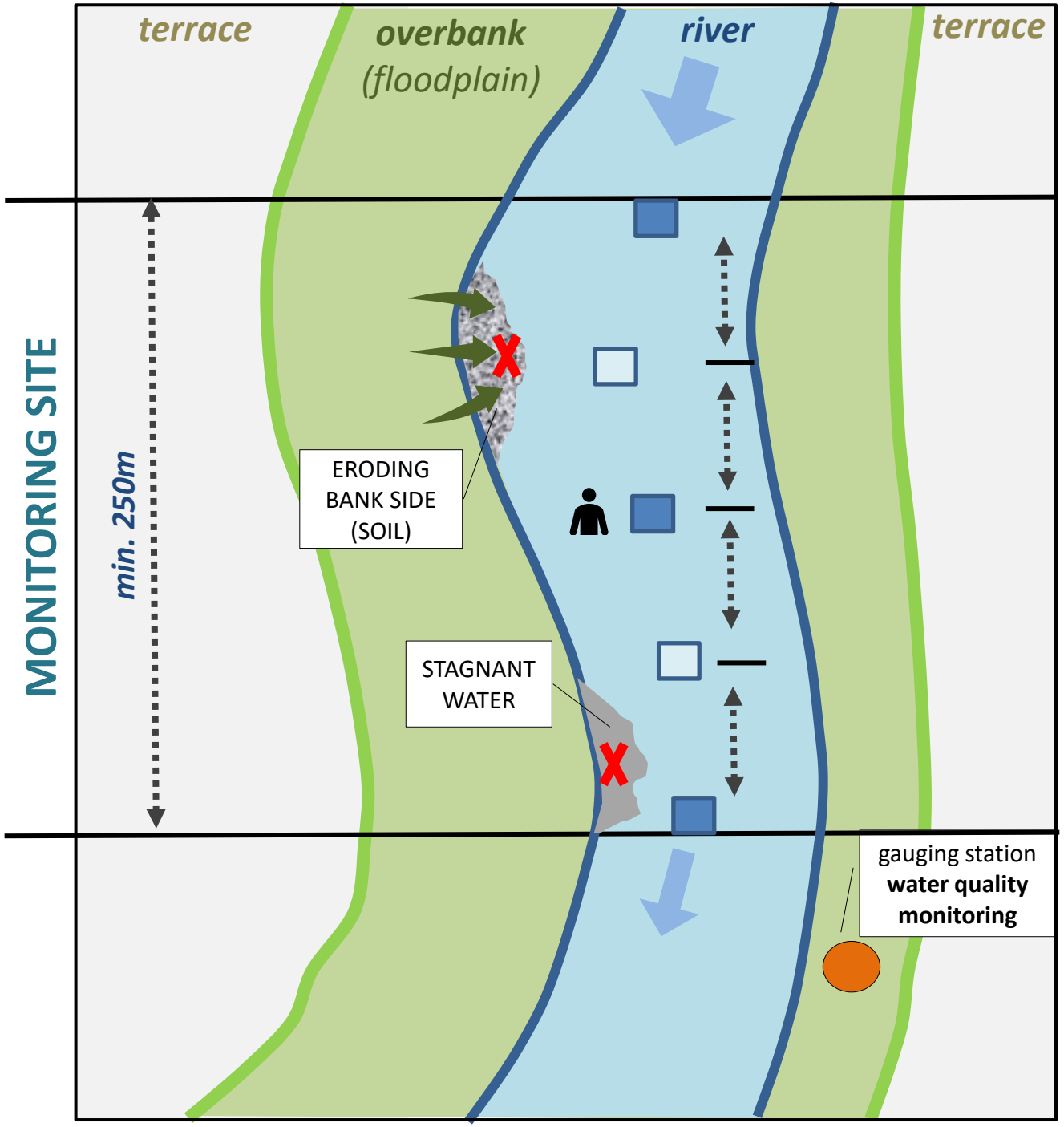
   - *Composite sample: 5-10 sub-samples (always at least 3)*

2. **SAMPLING POINTS EQUIDISTANT**
3. **SAMPLING POINTS IN MAIN STREAM LINE** *(active river flow)*
4. **AVOID STAGNANT (NON-ACTIVE) WATER**
5. **AVOID EDGE EFFECTS** *(local river bank erosion into river)*

VERTICAL DESIGN

1. **TOP 0-5 CM**
2. **AVOID PLANTS & PLANT REMNANTS**
3. **SAMPLED SEDIMENT IN CONTACT WITH (UNDER) RIVER WATER**





2.1 BOTTOM SEDIMENT

SAMPLING METHOD

1. **VACUUM CORER SYSTEM**

➕ *Precise depth control*

➕ *Very good representativity & reproducibility*

➖ *Requires specific tool & safety*

2. **SCOOP SYSTEM**

➖ *Limited depth control*

➕➖ *Requires expertise & experience: good representativity & reproducibility*

➕ *Requires no specific tool & safety*

➕ *Fast*

VIDEO: *SIMONA_BottomSediment_VACUUM_depth.mp4*

VIDEO: *SIMONA_BottomSediment_SCOOP.mp4*

SAMPLING METHOD OPTIONS

1. **YOU CAN COLLECT ADDITIONAL SAMPLES WITH ANY OTHER METHOD (SAMPLING SYSTEM)**
2. **AVOID GRAB SYSTEMS**

SAMPLE QUANTITY

1 kg *(top up 0.7L glass jar)*

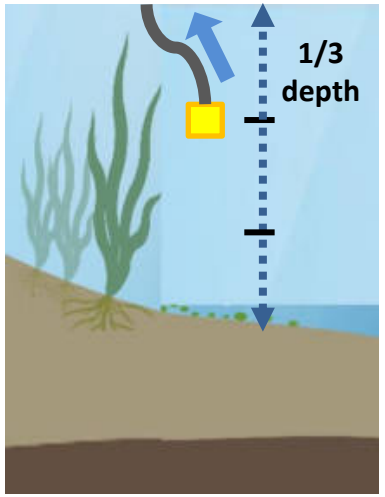
2.2 SUSPENDED SEDIMENT

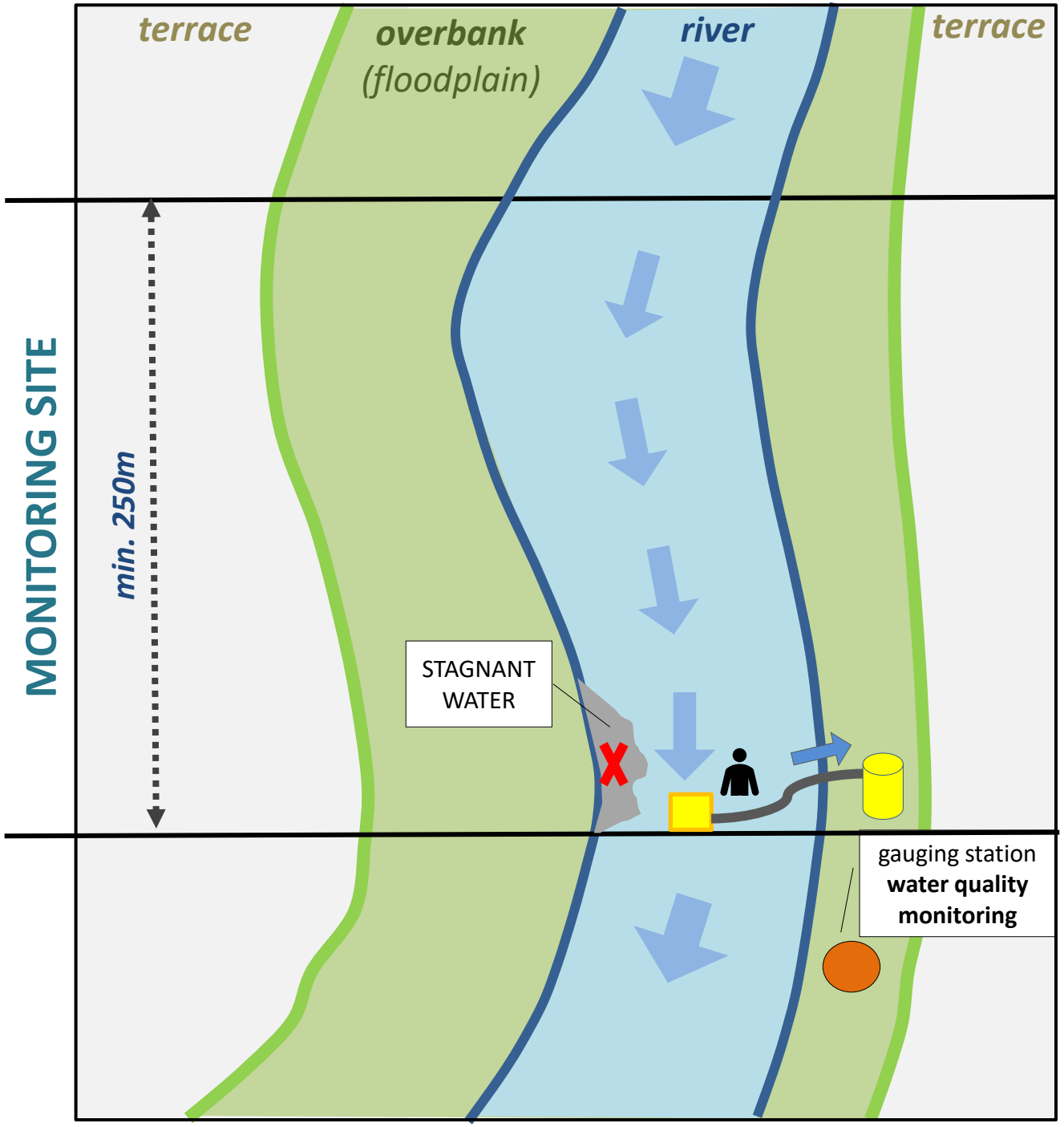
HORIZONTAL DESIGN

1. **ONE SAMPLING POINT**
   - *Composite sample: suspended sediment sample is natural composite by flowing river water mixing*
2. **SAMPLING POINT LOCACTION AT DOWNSTREAM END OF MONITORING SITE**
3. **SAMPLING POINTS IN MAIN STREAM LINE** *(active river flow)*
4. **AVOID STAGNANT (NON-ACTIVE) WATER**

VERTICAL DESIGN

1. **AT TOP 1/3 OF WATER DEPTH**





2.2 SUSPENDED SEDIMENT

SAMPLING METHOD

1. **BARREL SYSTEM**

SAMPLING METHOD OPTIONS

1. **YOU CAN COLLECT ADDITIONAL SAMPLES WITH ANY OTHER METHOD (SAMPLING SYSTEM)**

SAMPLE QUANTITY

1. **10L** or **30L** *(in plastic tank, barrel)*

VIDEO: *SIMONA_SuspendedSediment_BARREL.mp4*

2.3 OVERBANK SEDIMENT

HORIZONTAL DESIGN

1. **5 SAMPLING POINTS**

   - *Composite sample: 5 sub-samples (always at least 3)*

2. **SAMPLING POINTS EQUIDISTANT**

3. **SAMPLING POINTS ON ACTIVE OVERBANK**
   (overbank flooded min. once per year)

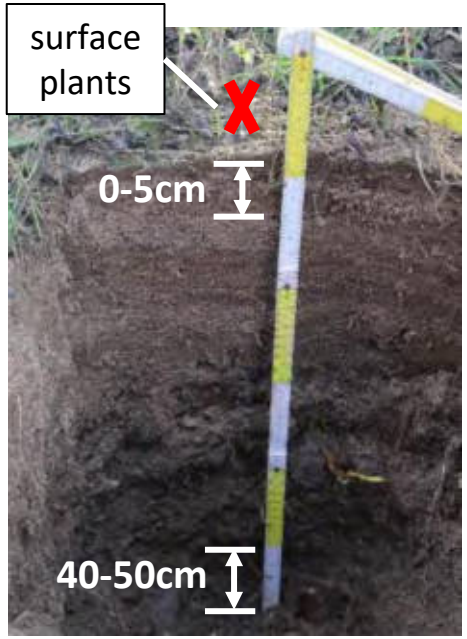
4. **AVOID EDGE EFFECTS** *(local side wall erosion onto overbank)*

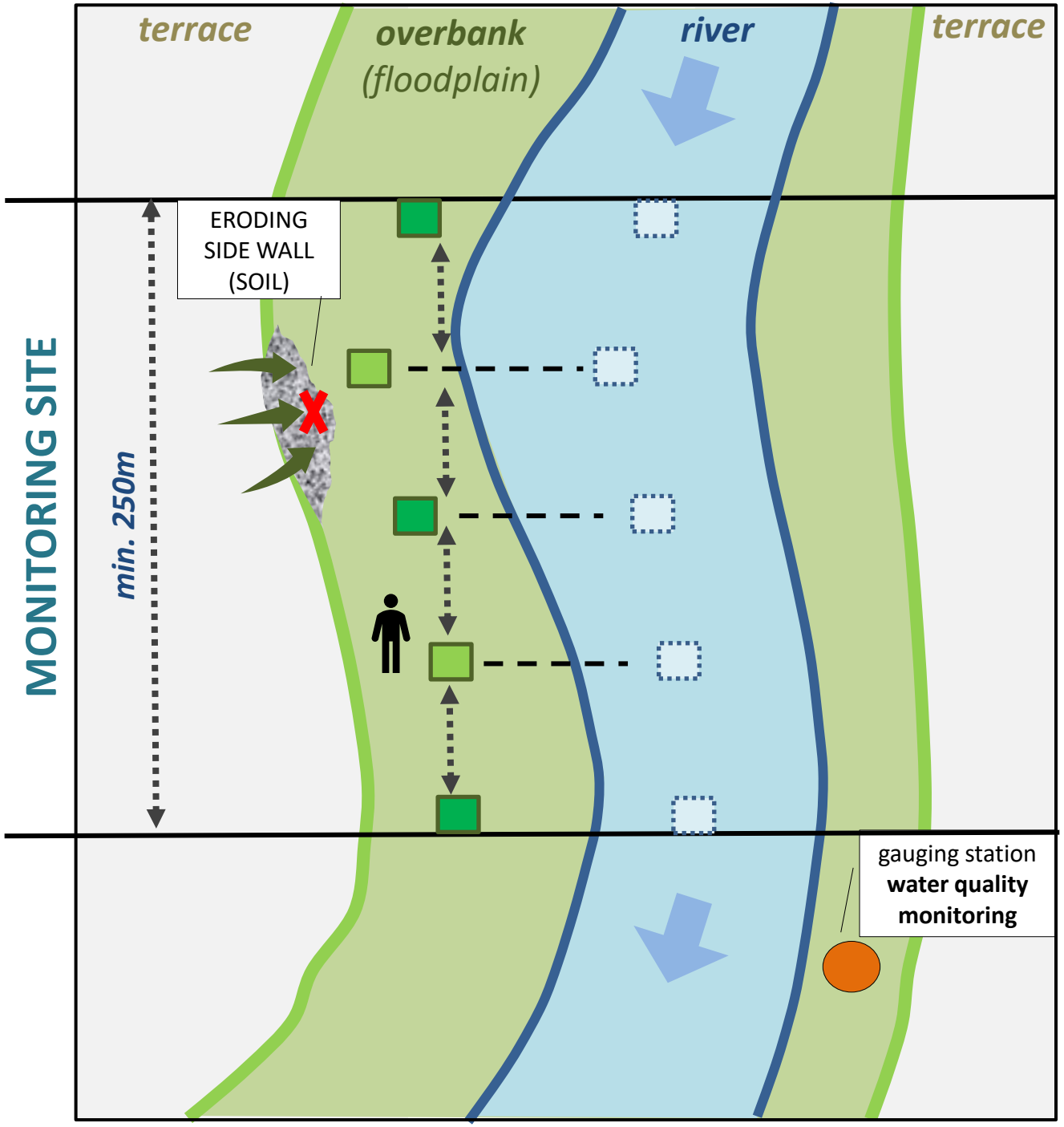
VERTICAL DESIGN

1. **TOP 0-5 CM**

2. **BOTTOM 40-50 CM**

3. **AVOID SURFACE PLANTS**





2.3 OVERBANK SEDIMENT

SAMPLING METHOD

1. **SPADE SYSTEM**

- *Precise depth control*
- *Very good representativity & reproducibility*
- *Very slow*

VIDEO: *SIMONA_Overbank_SPADE.mp4*

SAMPLING METHOD OPTIONS

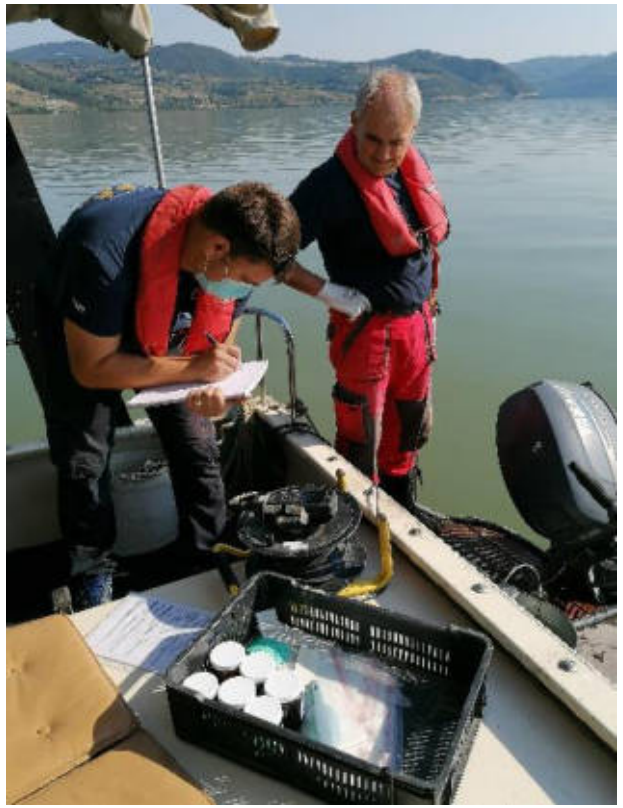
1. **YOU CAN COLLECT ADDITIONAL SAMPLES WITH ANY OTHER METHOD (SAMPLING SYSTEM) OR AT OTHER DEPTH (e.g. 0-25CM)**
2. **AVOID AUGER / CORER SYSTEMS**

SAMPLE QUANTITY

1. **1 kg (0-5cm)** *(top up 0.7L glass jar)*
2. **1 kg (40-50cm)** *(top up 0.7L glass jar)*

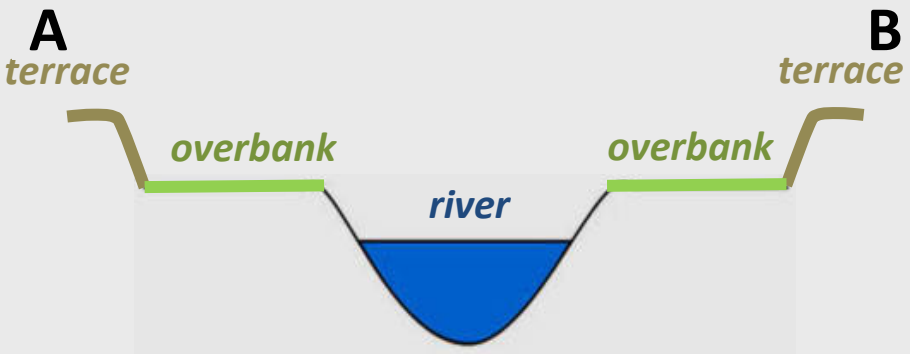
LARGE RIVER

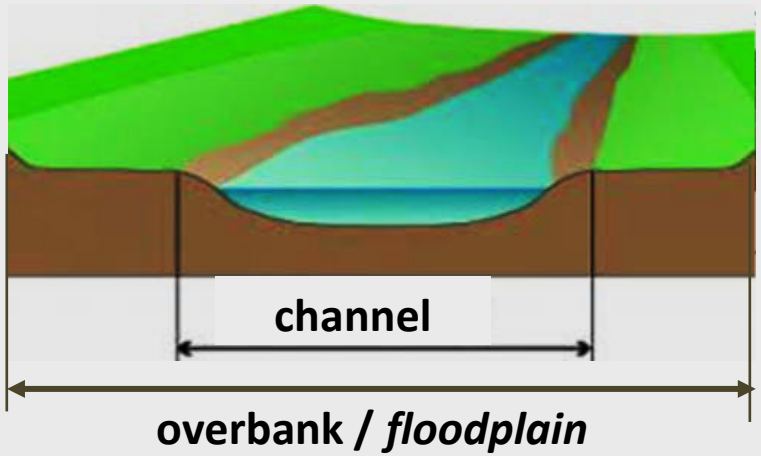
(sampling from boat)

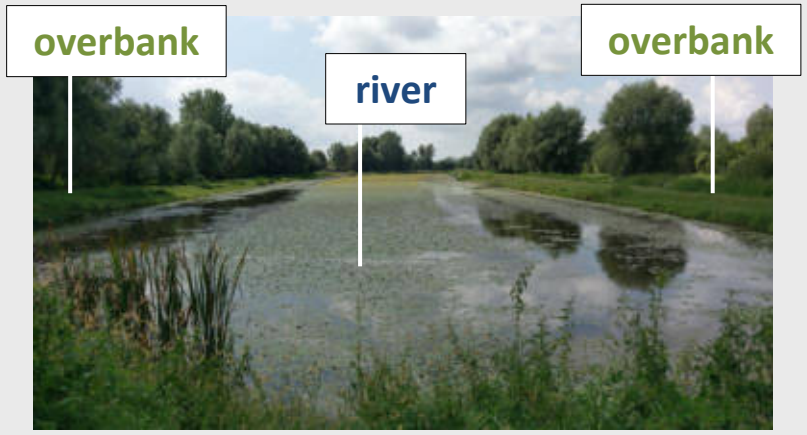


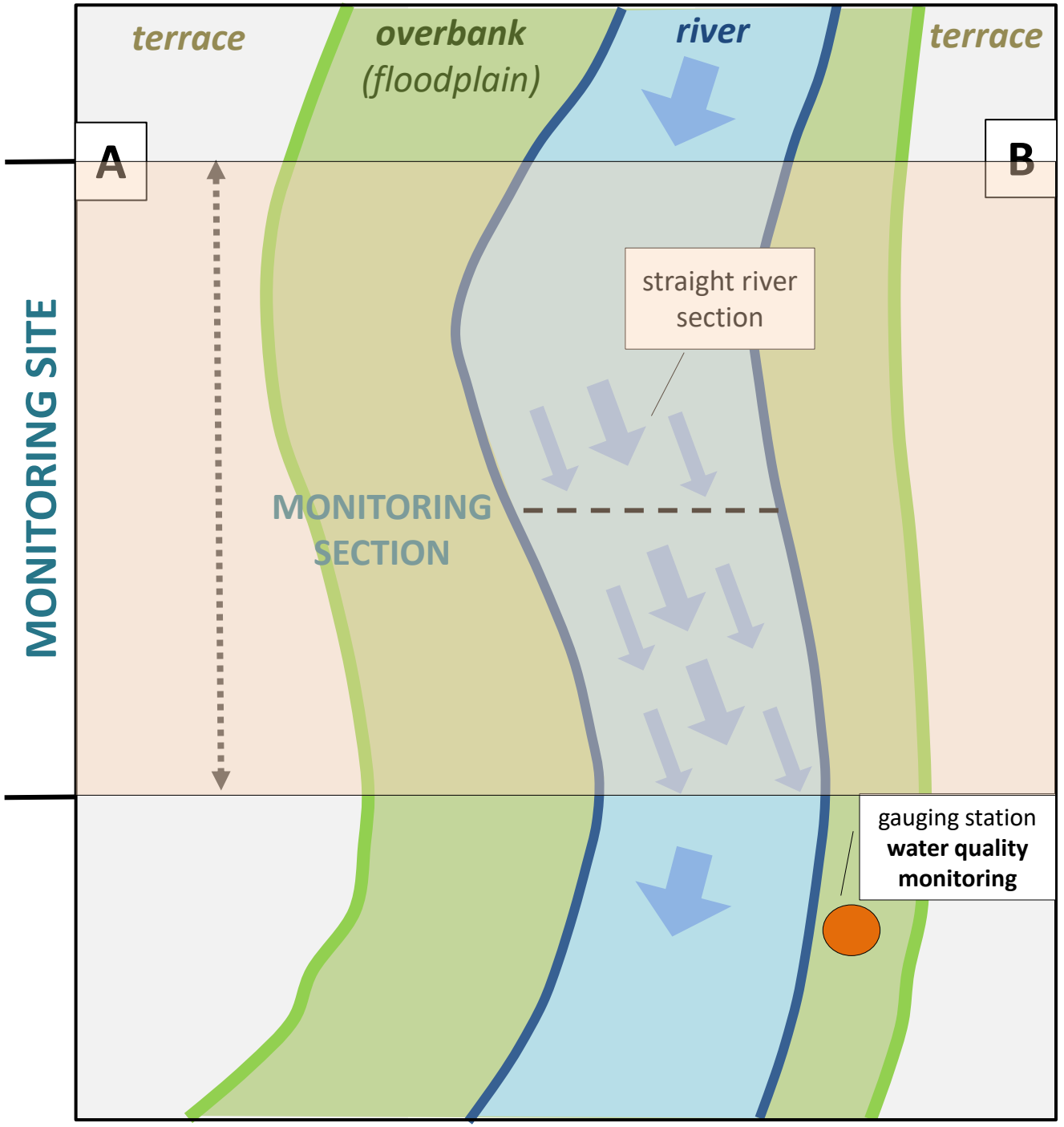
1. MONITORING SITE LOCATION

1. MONITORING SITE LOCATION



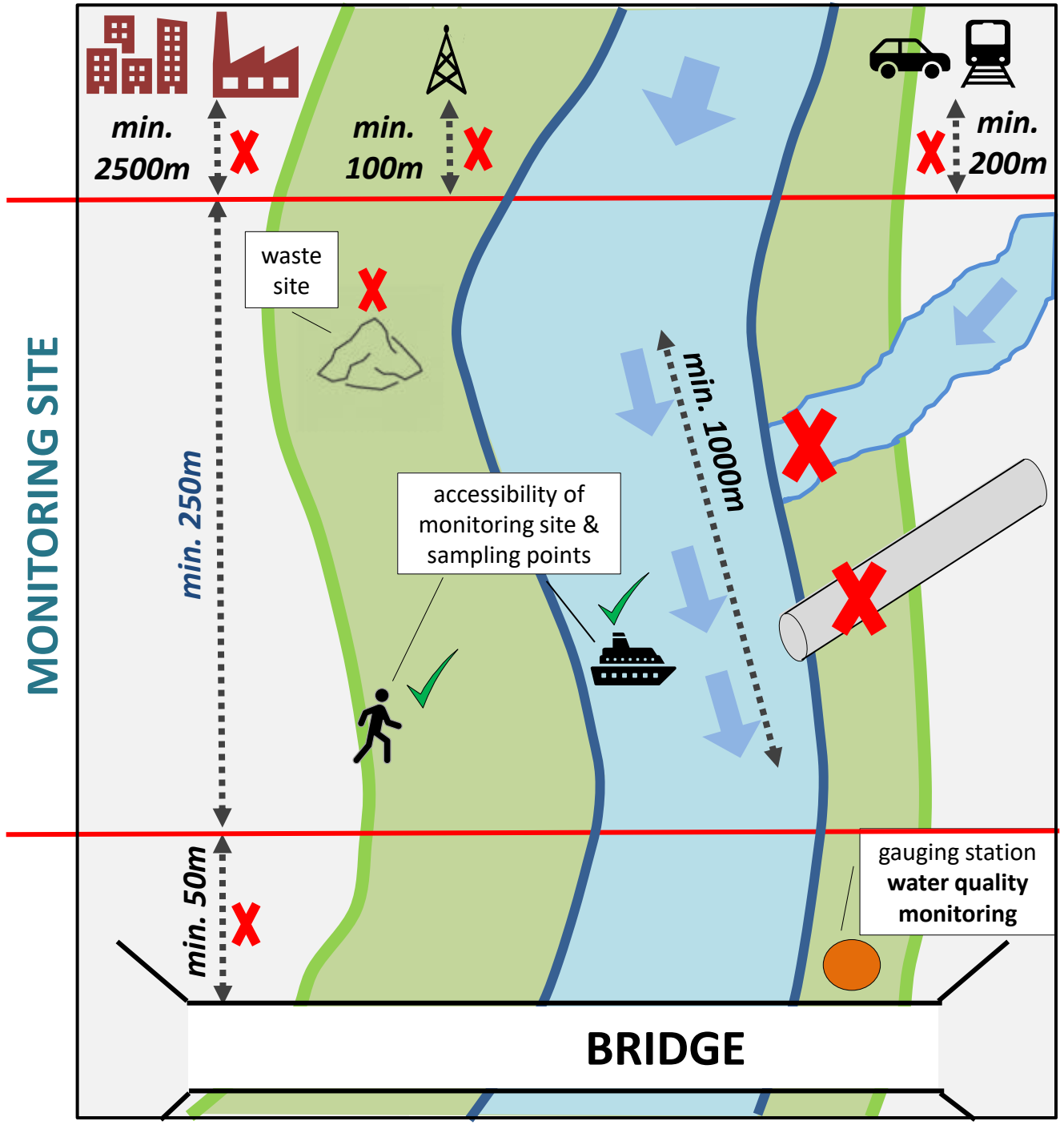






1. MONITORING SITE LOCATION

1. **AT NATIONAL WATER QUALITY MONITORING POINT** *(preferably upstream)*
2. **MIN. 250M LONG**
3. **STRAIGHT RIVER SECTION** *(min. 1000m)*
4. **BOTTOM SEDIMENT, SUSPENDED SEDIMENT, OVERBANK SEDIMENT SAMPLING POSSIBLE** *(availability, accessibility)*
5. **AVOID TRIBUTARY CONFLUENCE**
6. **AVOID KNOWN CONTAMINATED SITE**
7. **AVOID LOCAL CONTAMINATION SOURCE**
   - *Discharge channel or pipe*
   - *Waste site*
   - *Industry or power plant (min. distance 2500m)*
   - *Railway lines & major roads (min. distance 200m)*
   - *Electric line & pylon (min. distance 100m)*
   - *Bridge (min. distance 50m upstream)*
   - *Other sources*
7. **UNIFORM HYDROMORPHOLOGY**

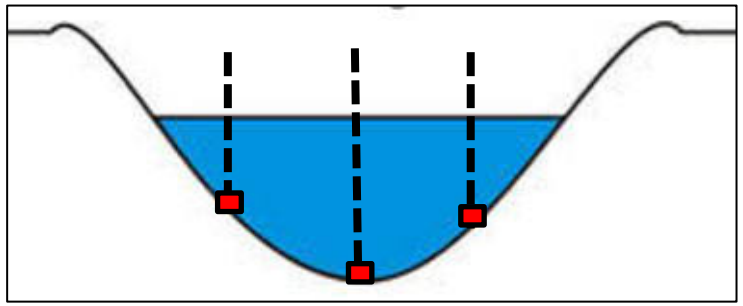


2. SAMPLING POINT LOCATION

2.1 BOTTOM SEDIMENT

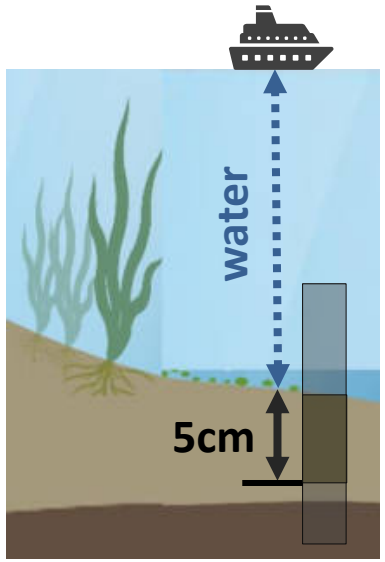
HORIZONTAL DESIGN

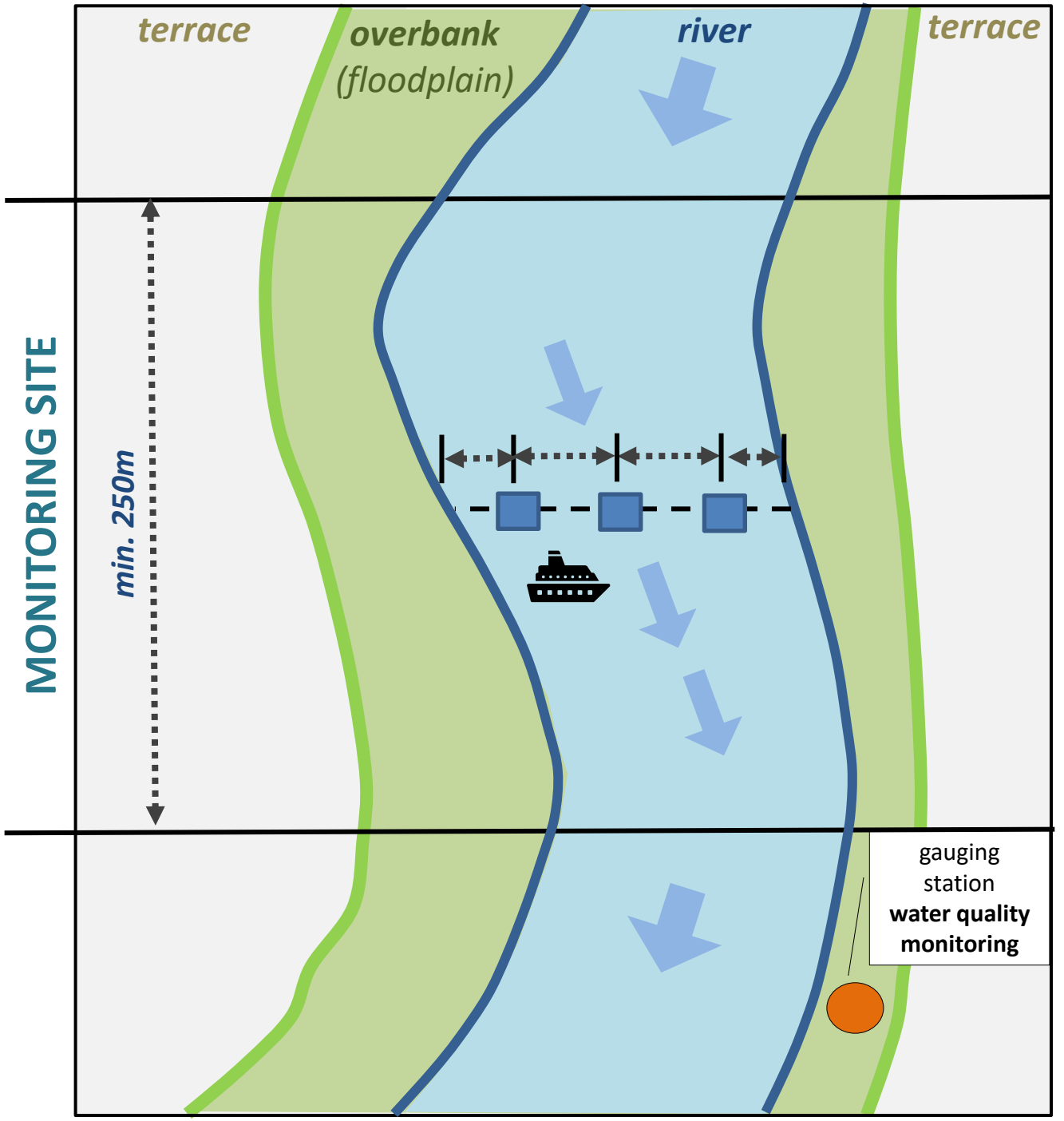
1. **3 SAMPLING POINTS AT LEAST**
   - *Composite sample: 3 sub-samples at least*
2. **SAMPLING TRANSECT IN STRAIGH RIVER SECTION**
3. **AVOID RIVER BENDS**
4. **SAMPLING POINTS EQUIDISTANT**
5. **SAMPLING POINTS IN MAIN STREAM LINE** *(active river flow)*



VERTICAL DESIGN

1. **TOP 0-5 CM**





2.1 BOTTOM SEDIMENT

SAMPLING METHOD

1. **CORER SYSTEM** *(vacuum or other type)*

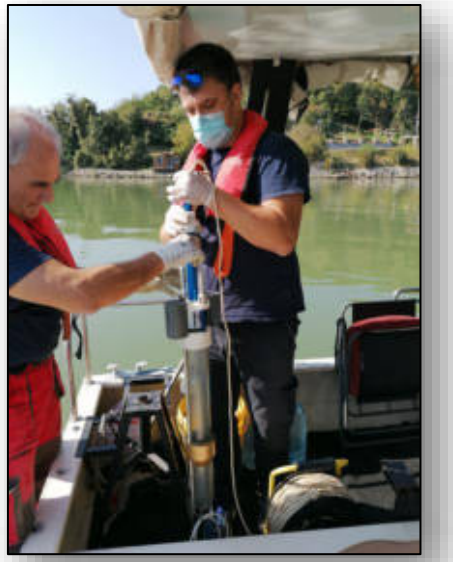
+ *Precise depth control*
+ *Very good representativity & reproducibility*
− *Requires specific tool & safety*

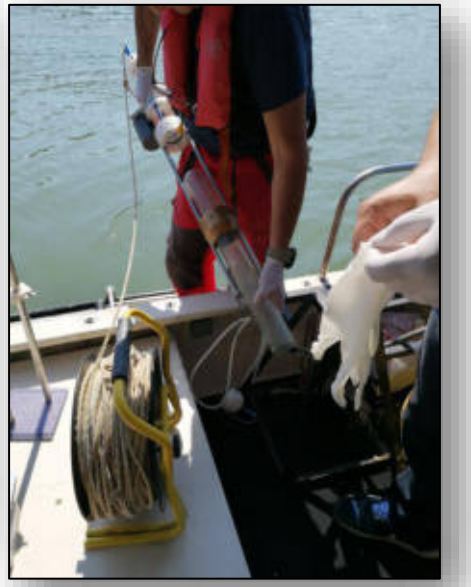
2. **SCOOP SYSTEM** *(manually along river bank)*

− *Limited depth control*
+ − *Requires expertise & experience: good representativity & reproducibility*
+ *Requires no specific tool & safety*
+ *Fast*

SAMPLING METHOD OPTIONS

1. **YOU CAN COLLECT ADDITIONAL SAMPLES WITH ANY OTHER METHOD (SAMPLING SYSTEM)**
2. **AVOID GRAB SYSTEMS**





SAMPLE QUANTITY

1 kg *(top up 0.7L glass jar)*

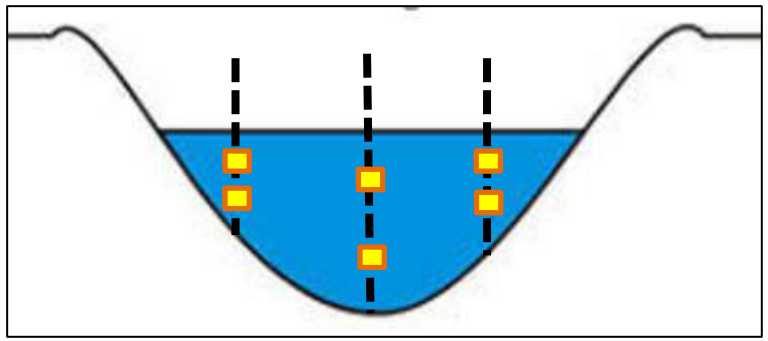
2.2 SUSPENDED SEDIMENT

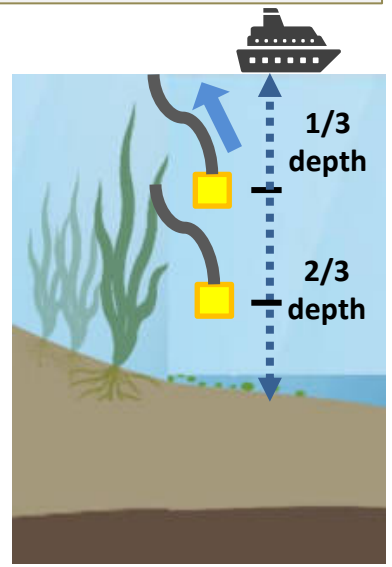
HORIZONTAL DESIGN

1. 3 SAMPLING POINTS AT LEAST
2. 2 DIFFERENT DEPTHS AT LEAST AT EACH POINT

- *Composite sample: 6 sub-samples at least*

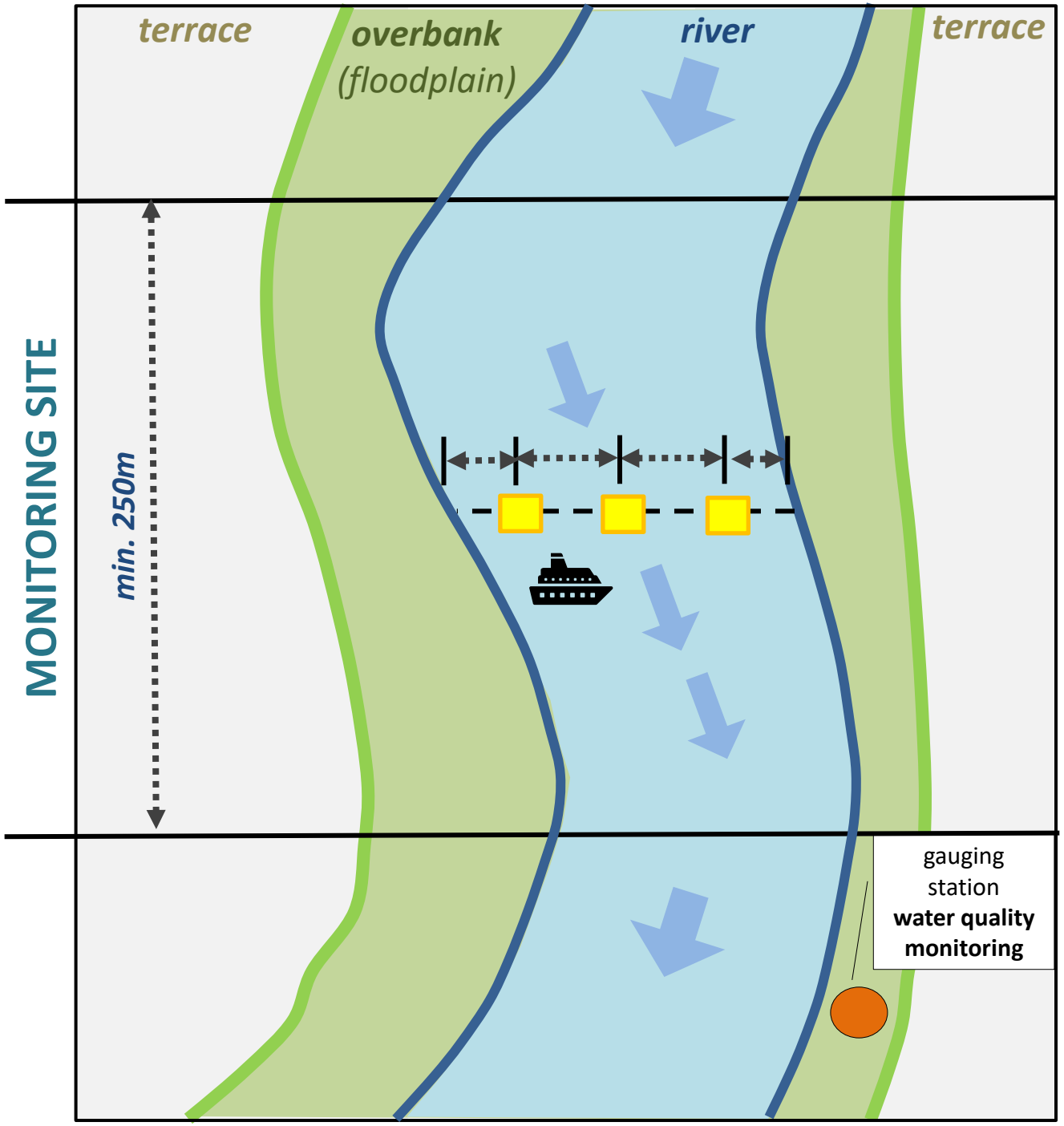
2. SAMPLING TRANSECT IN STRAIGH RIVER SECTION
3. AVOID RIVER BENDS
4. SAMPLING POINTS EQUIDISTANT
5. SAMPLING POINTS IN MAIN STREAM LINE *(active river flow)*





VERTICAL DESIGN

1. AT TOP 1/3 & 2/3 OF WATER DEPTH



2.2 SUSPENDED SEDIMENT

SAMPLING METHOD

1. **BARREL SYSTEM**

SAMPLING METHOD OPTIONS

1. **YOU CAN COLLECT ADDITIONAL SAMPLES WITH ANY OTHER METHOD (SAMPLING SYSTEM)**
2. **AVOID PASSIVE SYSTEMS (TIME INTEGRATED; EG. SEDIMENT BOX)**

SAMPLE QUANTITY

1. **10L** or **30L** *(in plastic tank, barrel)*

2.3 OVERBANK SEDIMENT

HORIZONTAL DESIGN

1. **5 SAMPLING POINTS**

   - Composite sample: 5 sub-samples (always at least 3)

2. **SAMPLING POINTS EQUIDISTANT**

3. **SAMPLING POINTS ON ACTIVE OVERBANK**
   (overbank flooded min. once per year)

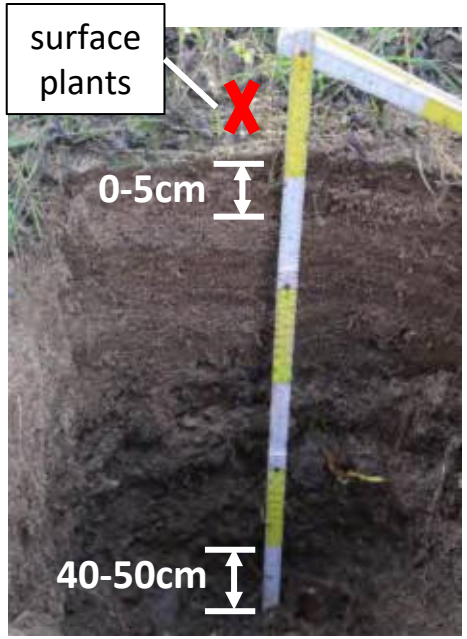
4. **AVOID EDGE EFFECTS** *(local side wall erosion onto overbank)*

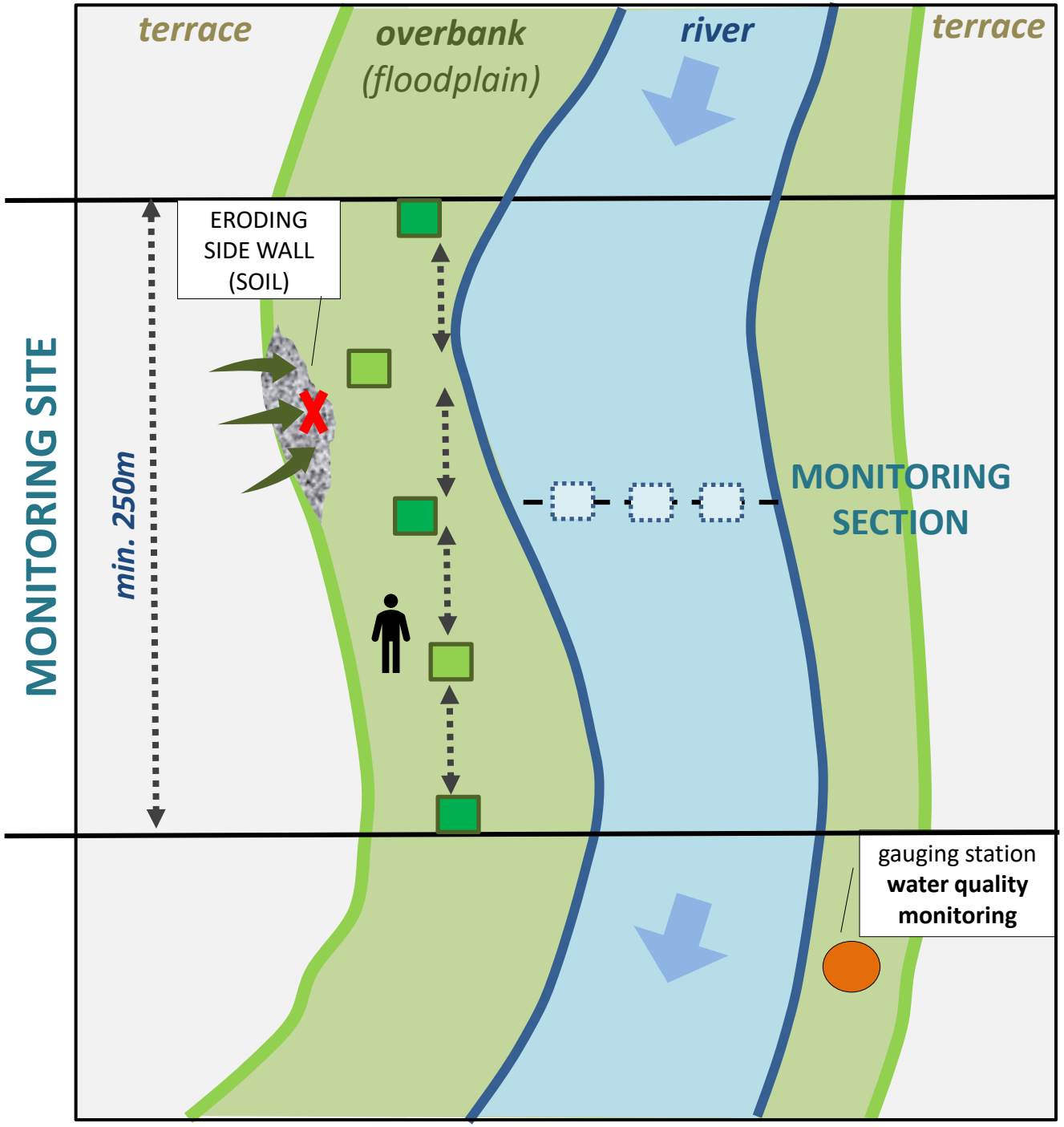
VERTICAL DESIGN

1. **TOP 0-5 CM**

2. **BOTTOM 40-50 CM**

3. **AVOID SURFACE PLANTS**





2.3 OVERBANK SEDIMENT

SAMPLING METHOD

1. **SPADE SYSTEM**

➕ *Precise depth control*

➕ *Very good representativity & reproducibility*

➖ *Very slow*

VIDEO: *SIMONA_Overbank_SPADE.mp4*

SAMPLING METHOD OPTIONS

1. **YOU CAN COLLECT ADDITIONAL SAMPLES WITH ANY OTHER METHOD (SAMPLING SYSTEM)**
2. **AVOID AUGER / CORER SYSTEMS**

SAMPLE QUANTITY

1. **1 kg (0-5cm)** *(top up 0.7L glass jar)*
2. **1 kg (40-50cm)** *(top up 0.7L glass jar)*

PROBE MEASUREMENTS

(water and sediment)

1 PROBES – WATER

HORIZONTAL DESIGN

1. **ONE SAMPLING POINT**

- *Composite sample: flowing river water is natural composite*

2. **SAMPLING POINT LOCACTION:**

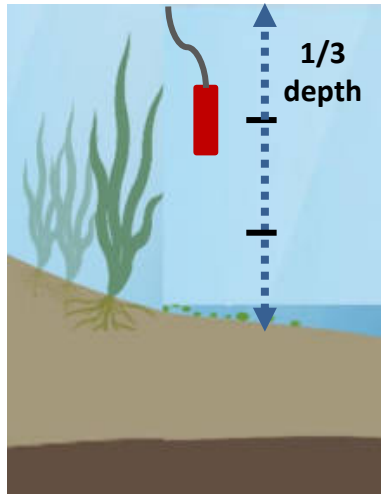
- *Small river: at downstream end of monitoring site*
- *Large river: at centre of monitoring section*

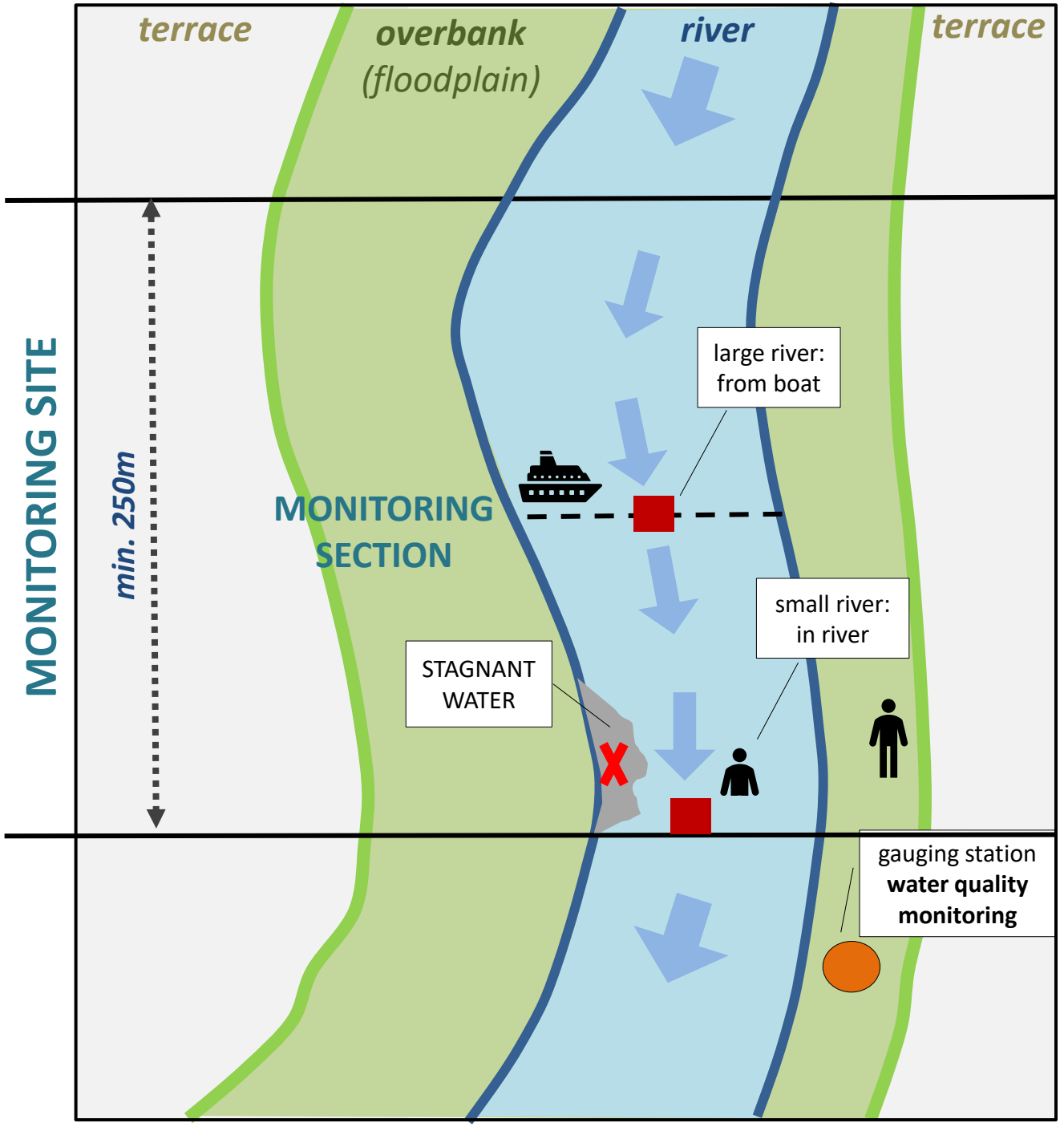
2. **SAMPLING POINT IN MAIN STREAM LINE** *(active river flow)*

3. **AVOID STAGNANT (NON-ACTIVE) WATER**

VERTICAL DESIGN

1. **AT TOP 1/3 OF WATER DEPTH**





1 PROBES – WATER

SAMPLING METHOD

1. **WATER PROBE SYSTEM**

   - *Insert probes (T, EC, pH, DO, Redox) into water & take measurements*

VIDEO: *SIMONA_Measure_PROBES_water_01_depth.mp4*

SAMPLING METHOD OPTIONS

1. **YOU CAN COLLECT ADDITIONAL SAMPLES WITH ANY OTHER METHOD (SAMPLING SYSTEM)**
2. **AVOID AUGER / CORER SYSTEMS**
3. **ADDITONAL PROBE MEASUREMENTS ALONG THE MONITORING SITE OR ACROSS THE MONITORING SECTION** *(to gain information about heterogeneity such as groundwater inflow)*

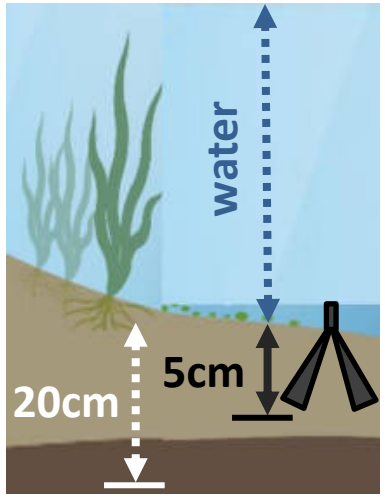
2 PROBES – SEDIMENT

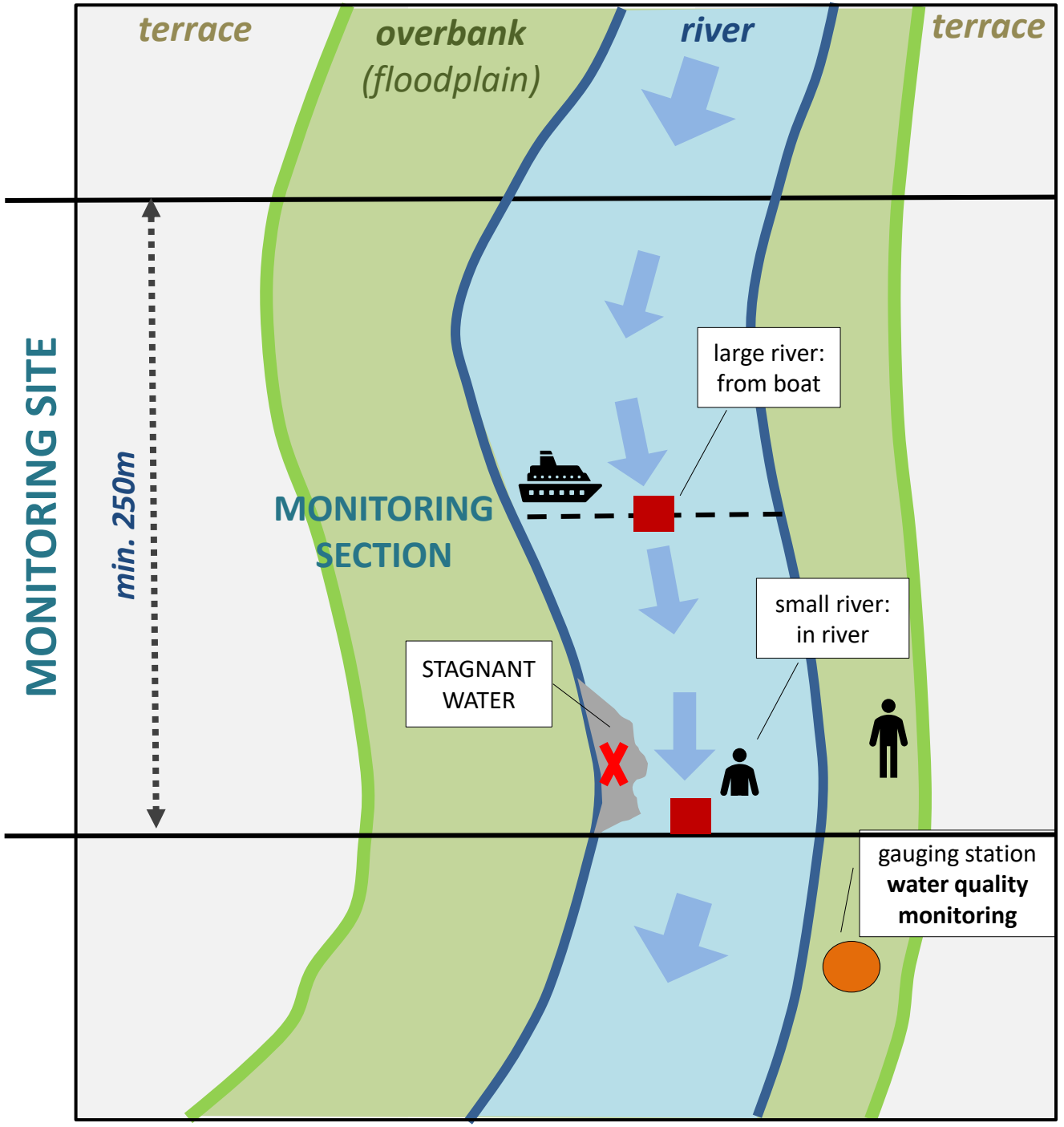
HORIZONTAL DESIGN

1. **ONE SAMPLING POINT** ■
   - *Composite sample: flowing river water is natural composite*
2. **SAMPLING POINT LOCACTION:**
   - *Small river: at downstream end of monitoring site*
   - *Large river: at centre of monitoring section*
2. **SAMPLING POINT IN MAIN STREAM LINE** *(active river flow)*
3. **AVOID STAGNANT (NON-ACTIVE) WATER**

VERTICAL DESIGN

1. **TOP 5-10-20CM**
2. **AVOID PLANTS & PLANT REMNANTS**
3. **SAMPLED SEDIMENT IN CONTACT WITH (UNDER) RIVER WATER**



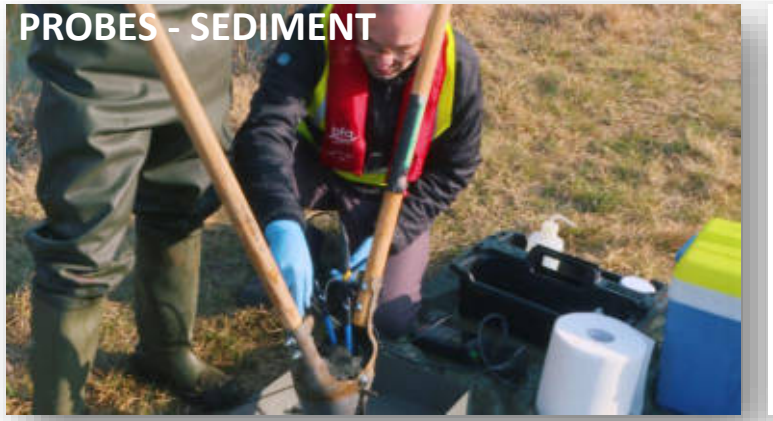


2 PROBES – SEDIMENT

SAMPLING METHOD

1. **GRAB SYSTEM**

- *Grab upper 5-10-20cm bottom sediment*
- *Insert probes (T, EC, pH, DO, Redox) into top 5 cm of sediment in the grab sampler and take measurements*



VIDEO: *SIMONA_Measure_PROBES_sediment.mp4*

DRAFT

FIELD MANUAL

sampling instructions for the collection of the SIMONA National Sediment Quality Monitoring Baseline Network samples

BOTTOM SEDIMENT

Vacuum corer system

Gyozo Jordan and Franko Humer

SEE THE VIDEO: *SIMONA_BottomSediment_VACUUM_depth.mp4*

Project co-funded by the European Union
http://www.interreg-danube.eu/approved-projects/simona

BOTTOM SEDIMENT

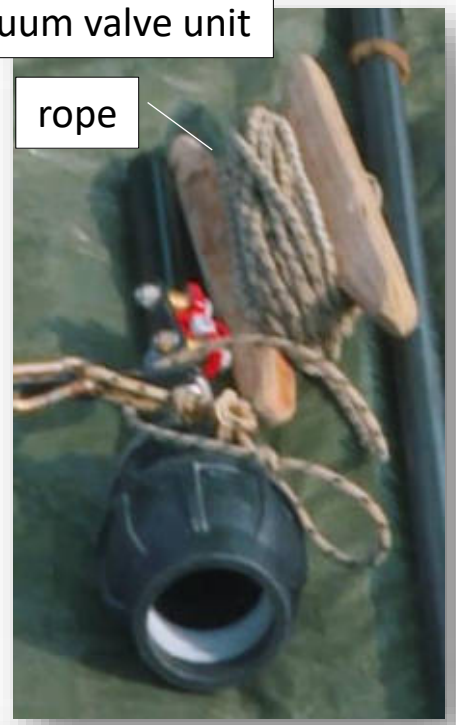
vacuum corer system

EQUIPMENT – SAMPLING

CHECKLIST:

- **VACUUM VALVE UNIT**
- **PLEXIGLASS TUBE** *(2 min. 50cm; disposable)*
- **CAPS FOR PLEXIGLASS TUBE**
- **IRON STICKS** *(extensions for vacuum corer)*
- **PISTON** *(for pushing out sample from plexiglass tube)*
- **PISTON HOLDING UNIT**
- **ROPE** *(for closing valve under water)*
- **SMALL SMARKED PLEXIGLASS TUBE** *(15cm; disposable)*
- **SAMPLE CONTAINER** *(min. 0.7L glass jar)*


vacuum valve unit


rope

plexiglass tube


cap


piston

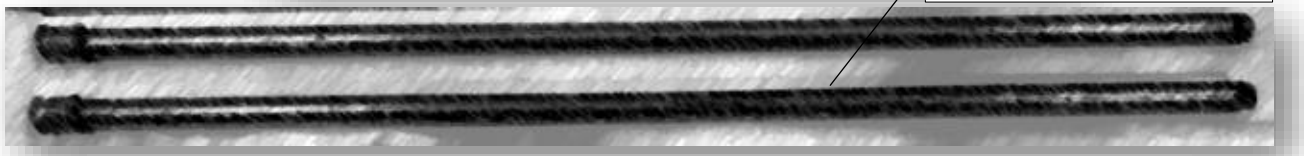

piston holding unit


glass jar

spackling knife

plexiglass tube extension

iron extensions



EQUIPMENT – TOOLS

CHECKLIST:

- **LOCATION MEASURE: GPS**
- **DISTANCE MEASURE** *(laser & light reflecting target OR tape measure)*
- **WATER DEPTH MEASURE** *(scaled expandable stick)*
- **DIGITAL CAMERA**

- **FIELD SHEET IN WATER PROOF FOLDER**
- **PEN, MARKER PEN**
- **DIGITAL CAMERA** *(batteries)*
- **STICK-ON LABEL**
- **PERMANENT PEN: BLACK**

- **GLOVES** *(disposable, powder free)*

- **2 TRAINED PERSONNEL**

CONTROL QUESTIONS:

- **DO THE DEVICES OPERATE?** *(GPS, laser, camera, pump)*
- **ARE THE BATTERIES CHARGED?**

- **ARE THE TOOLS & EQUIPMENT IN GOOD CONDITION?** *(demaged or broken tools, etc.)*
- **ARE THE TOOLS & EQUIPMENT CLEAN?** *(sample container, pump, pipe, beaker)*

- **IS IT SAFE TO COLLECT SAMPLE?** *(safety gear, health & readiness, weather, site conditions)*

DO NOT START SAMPLING UNLESS ALL ANSWERS ARE 'YES'.

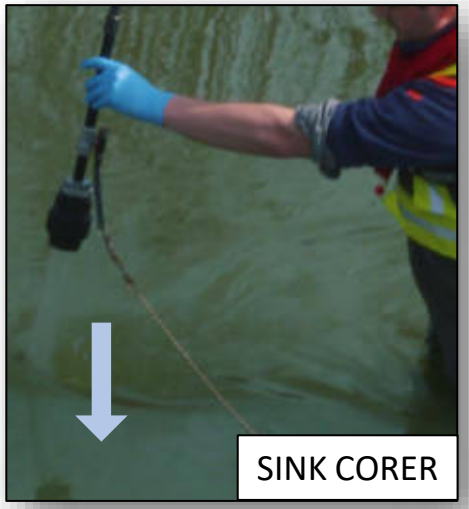
PHASE 1: PREPARE FOR SAMPLING


DOCUMENTATION

PHASE 2: GETTING READY FOR SAMPLING


GLOVES

PHASE 3: SAMPLE COLLECTION


SINK CORER


SAMPLE INTO COOL BOX

PHASE 4: CLOSING SAMPLING

PHASE 1: PREPARE FOR SAMPLING 1/3

1. SET UP THE SAMPLING STATION AT SAMPLING POINT:

- lay canvas on ground, place equipment on it

DOCUMENTATION

2. TAKE THE GPS COORDINATES OF SAMPLING POINT *(WGS84)*

3. COMPLETE FIELD SHEET:

- site ID, sampling point GPS coordinates, sample ID, date, etc.

4. PUT SAMPLE ID & DATE ON CONTAINER:

- 1. stick-on label and 2. sample container (glass jar)

- stick label on container (glass jar)

5. TAKE PHOTO-1 ON SAMPLE ID *(sample container or field sheet)*

1. SAMPLING STATION

2. GPS

3. FIELD SHEET

5. PHOTO-1 LABEL

4. SAMPLE LABELLING

PHASE 1: PREPARE FOR SAMPLING 2/3

6. SET UP THE SAMPLING EQUIPMENT:

- *join plexiglass tube to vacuum valve unit*
- *fix extention to sampling unit*
- *open valve*

join plexiglass tube to vacuum valve unit

fix extention to sampling unit

TYPICAL MISTAKES:
Tube is not fixed air-tight to the vacuum valve unit, so vacuum cannot develop in tube during sampling.

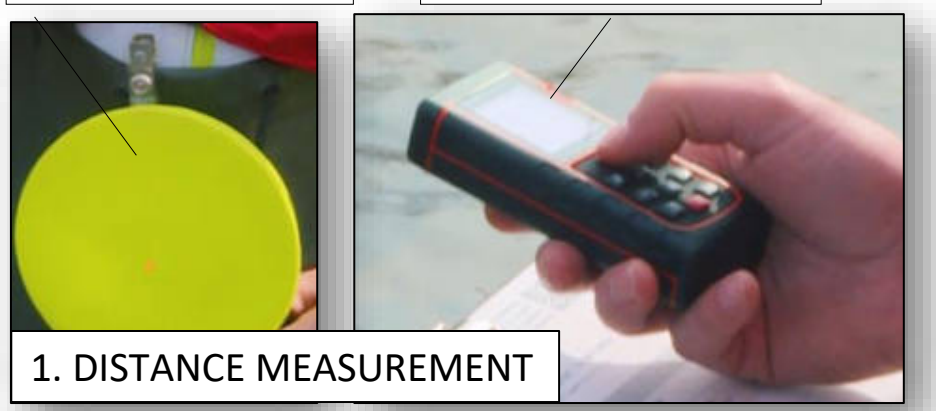
PHASE 1: PREPARE FOR SAMPLING 3/3

DOCUMENTATION

1. **MEASURE DISTANCE BETWEEN RIVER BANK & SAMPLING POINT**
   - *with laser & light reflecting target OR tape measure; ± 5 cm accuracy*
2. **MEASURE WATER DEPTH**
   - *scaled stick; ± 5 cm accuracy*
3. **WRITE MEASUREMENT RESULTS IN FIELD SHEET**

light reflecting target

laser distance measure



1. DISTANCE MEASUREMENT

water depth measurement

distance measurement

2. WATER DEPTH MEASUREMENT

tape distance measure

1. DISTANCE MEASUREMENT

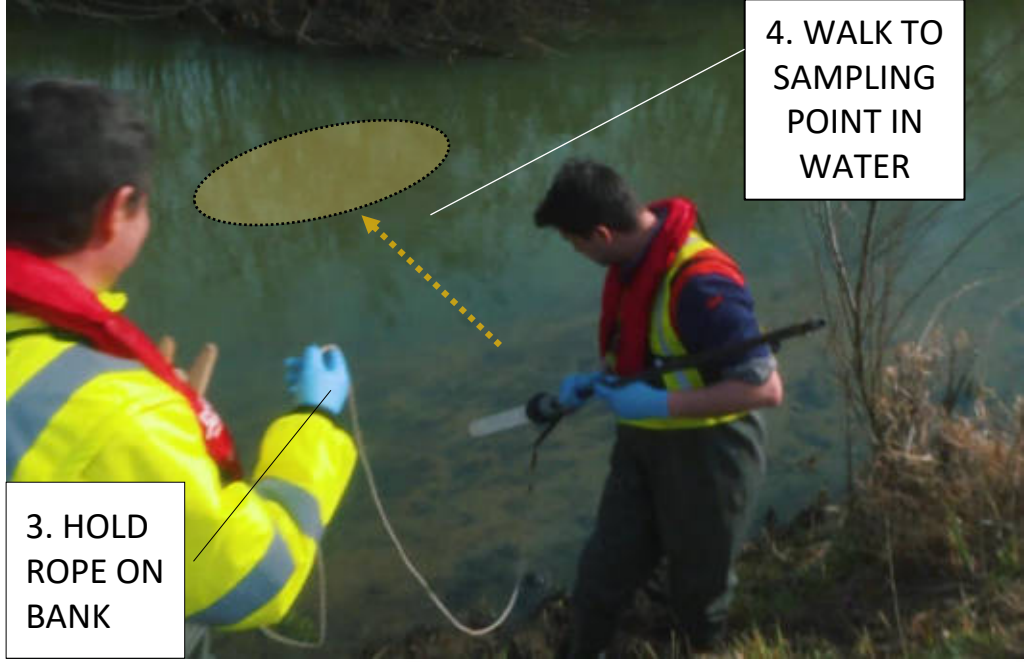
3. FIELD SHEET

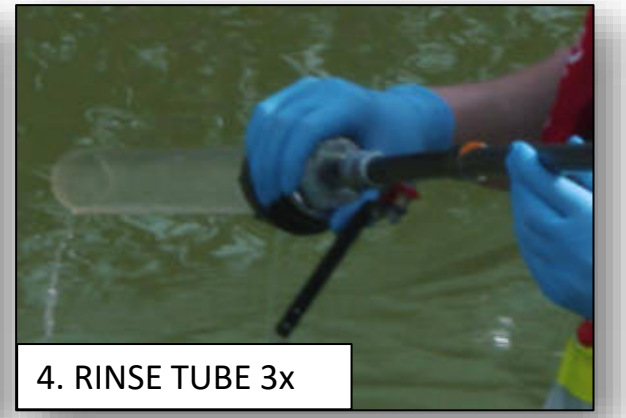
PHASE 2: GETTING READY FOR SAMPLING

1. **SAMPLERS: PUT ON GLOVES** *(powder free)*
2. **SAMPLER 1**: **WALK INTO THE WATER** to the **sampling point** (active flowing streamline) with the vacuum corer.
3. **SAMPLER 2**: Hold the rope fixed to the ball valve from the river bank.
4. **SAMPLER 1**: Equilibrate the sampling equipment (plexiglass tube) with the stream water by rinsing 3 times.

TYPICAL MISTAKES:

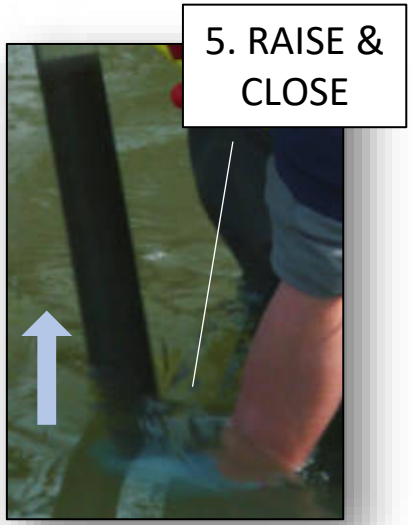
1. Sampler in water disturbs up bottom sediment while approaching the sampling point.
2. Sampling system is not thoroughly equilibrated with the stream water by **rinsing**.
3. Valve is closed.





PHASE 3: SAMPLE COLLECTION 1/5

1. **SAMPLER 1**: Signal 'SAMPLING STARTS!'
2. **SAMPLER 1**: Sink the corer gently under water (valve open) until hitting the bottom sediment mildly *(not to disturbe uppermost layer)*
3. **SAMPLER 1**: Push the corer into sediment
4. **SAMPLER 1**: Close the valve *(develop vacuum)*
5. **SAMPLER 1:** Raise corer with sample in the tube above water and close the bottom of the tube with your hand before the corer is taken out of the water.



TYPICAL MISTAKES:

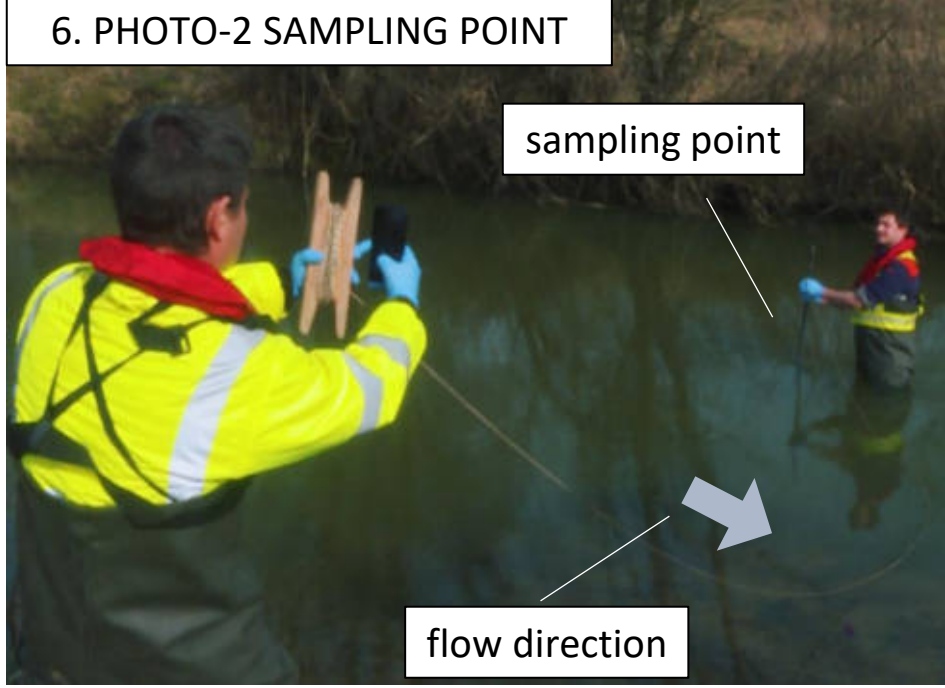
1. Sampler in water disturbes up bottom sediment during sampling.
2. Vacuum is not tight, so sediment is lost from tube under water while raising the corer.

PHASE 3: SAMPLE COLLECTION 2/5

6-10. SAMPLER 2: Take **photos**:

- **PHOTO-2**: sampling point *(sample collection conditions)*
- **PHOTO-3,4,5,6**: landscape photos upsteam, downstream, right bank, left bank.

6. PHOTO-2 SAMPLING POINT



7. PHOTO-3 UPSTREAM

8. PHOTO-4 DOWNSTREAM

9. PHOTO-5 RIGHT BANK

10. PHOTO-6 LEFT BANK

PHASE 3: SAMPLE COLLECTION 3/5

11. **SAMPLER 1**: Walk out from water, bringing core sample to the sampling station on the river bank.
12. **OPEN VALVE (release vacuum), RELEASE COLLAR**
13. **REMOVE VALVE UNIT FROM PLEXIGLASS TUBE, KEEP TUBE UPRIGHT**

11. BRING CORE SAMPLE TO GROUND

12. OPEN VALVE

13. SEPARATE VALVE UNIT FROM TUBE

TYPICAL MISTAKES:

1. SAMPLER 1 does not hold pleaxiglass tube firm enough, so core drops to the ground and sample is lost.
2. SAMPLER 1 does not close the bottom of the tube firm enough, so sample is sliding out and lost downwords.

PHASE 3: SAMPLE COLLECTION 4/5

14. INSERT PUSH-OUT PISTON INTO PISTON HOLDING UNT

15. INSERT PUSH-OUT FROM THE BOTTOM OF PLEXIGLASS TUBE

16. PUSH TUBE DOWNWARDS *(piston pushes the sample upwards)* **UNTIL ALL WATER ABOVE THE SEDIMENT TOP IS LOST FROM TUBE**

15. PISTON INTO TUBE

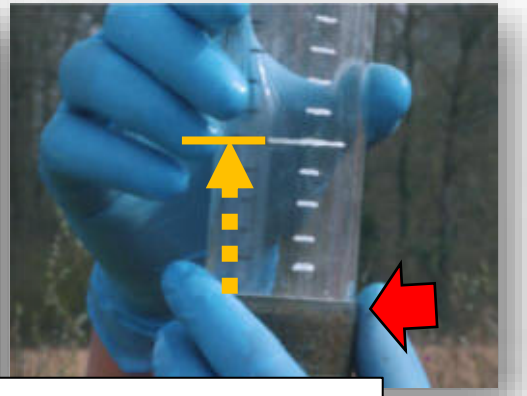
14. INSERT PISTON INTO PISTON HOLDING UNIT

16. PUSH TUBE DOWN, LOSE WATER FROM TUBE

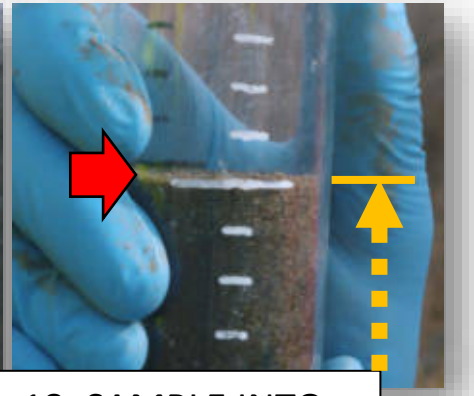
TYPICAL MISTAKES:
Tube is pushed too fast, so top of sediment core sample is pushed out and lost.

PHASE 3: SAMPLE COLLECTION 5/5

17. **FIT SMALL PLEXIGLASS EXTENSION TUBE** *(cm markers)* **TIGHT TO THE UPPER OPENING OF THE SAMPLE TUBE**
18. **PUSH CORE SAMPLE UPWARD INTO SMALL TUBE UNTIL MARKER** *(uppermost 5cm)* *(use hammer if needed; put protecting cap on small tube)*
19. **MOVE SAMPLE FROM SMALL TUBE INTO SAMPLE CONTAINER** *(glass jar)*
20. **CLOSE SAMPLE CONTAINER**
21. **SAMPLER 1:** Signal 'SAMPLING COMPLETED!'

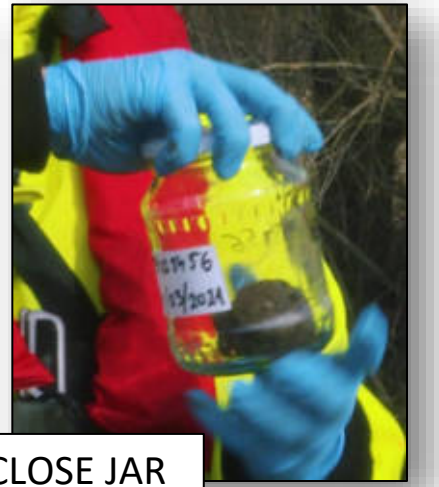


17. FIT SMALL TUBE



18. SAMPLE INTO SMALL TUBE

19. MOVE SAMPLE INTO JAR

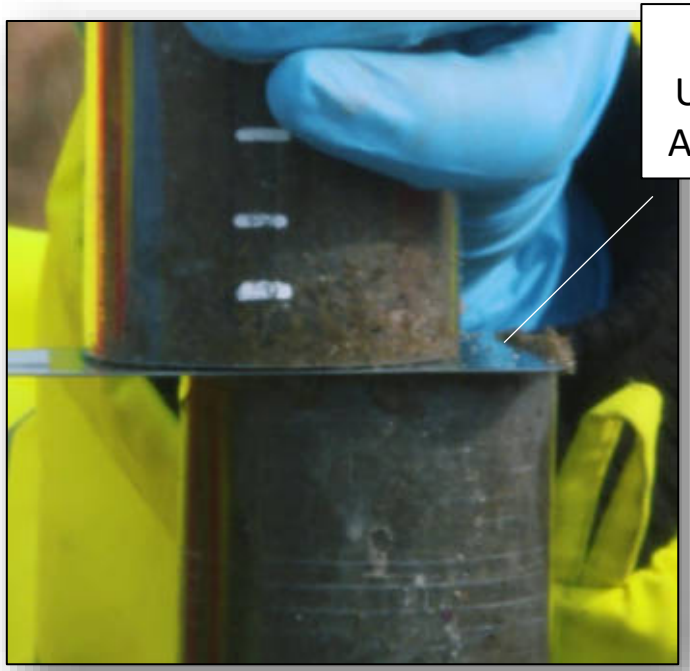


20. CLOSE JAR

PHASE 3: SAMPLE COLLECTION 5/5

ALTERNATIVE:

19. USE SPACKLING KNIFE TO MOVE SAMPLE IN SMALL TUBE INTO SAMPLE CONTAINER *(glass jar) (in case of loose, moddy sediment to avoid loss of sample*



14. SAMPLE INTO JAR USING SPACKLING KNIFE AT SMALL TUBE BOTTOM

PHASE 4: CLOSING SAMPLING

1. **PUT THE SAMPLE INTO COOL BOX (2-8 C°)**
2. **DISPOSE DISPOSABLE SAMPLING UNIT:**
   - Dispose disposable plexiglass core tube
   - Dispose small extension plexiglass tube
3. **PUT EQUIPMENT & TOOLS INTO BOX**
4. **PUT COOL BOX, EQUIPMENT & TOOLS INTO TRANSPORT VEHICLE**
5. **SECURE THE GLASS CONTAINERS AGAINST BREAKING DURING TRANSPORT.**

DOCUMENTATION

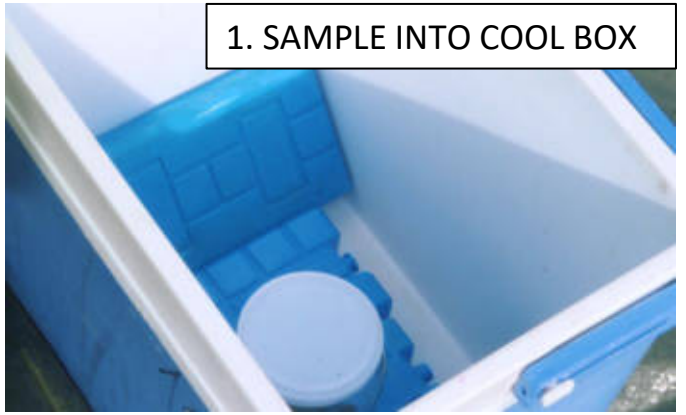
6. **COMPLETE & CHECK FIELD SHEET DOCUMENTATION**
7. **CHECK PHOTO DOCUMENTATION**

TYPICAL MISTAKES:

1. Field documentation is incomplete, not checked and corrected.

2. Glass containers break during transport due to insufficient securing.

1. SAMPLE INTO COOL BOX



4. COOL BOx INTO VEHICLE

EXAMPLES FOR BOTTOM SEDIMENT COLLECTION

VACUUM CORER SYSTEM

Figure 36. Pushing out the top 5 cm of bottom sediment with vacuum core system

Figure 5.3. Loading jar with bottom layer sediment from the vacuum core system

Figure 2.6. Loading jar with bottom sediment from the vacuum core system

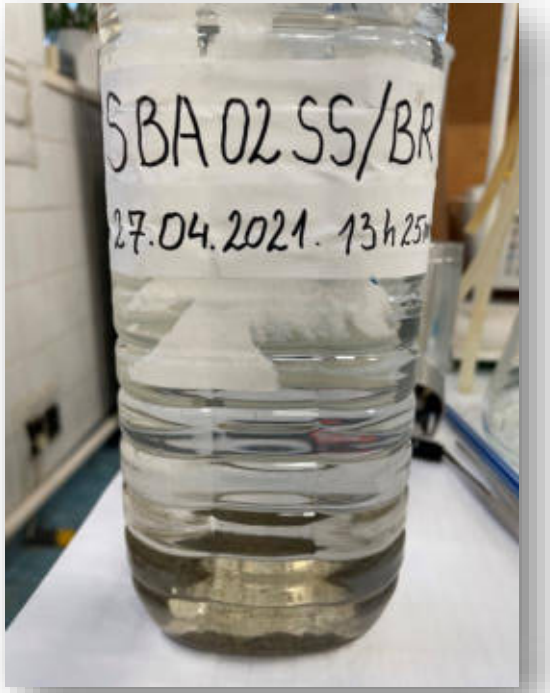
Figure 3.6. Loading jar with bottom sediment from the vacuum core system

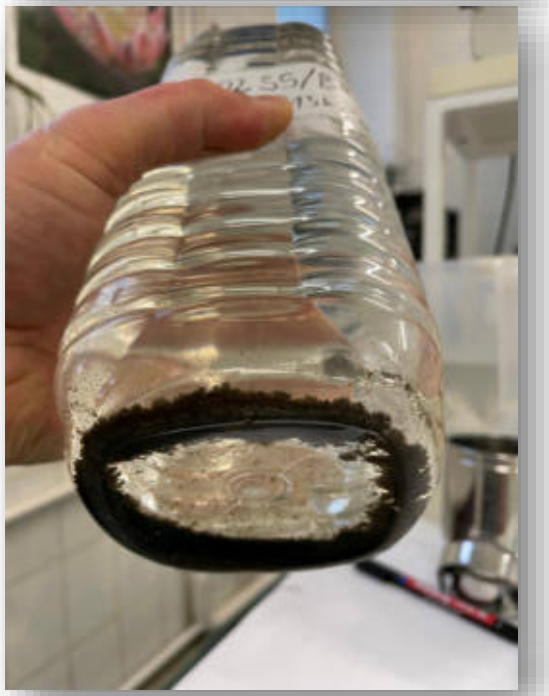
Figure 1.7. Loading a jar with bottom layer of the bottom sediment from the vacuum core system

BEHIND THE SCENE

SAMPLE TRANSPORT

SAMPLE CONTAINERS





GEONARDO

Interreg
Danube Transnational Programme
SIMONA

SIMONA IT Tool

2nd Training event, 28 June 2021

Bese Pál, Geonardo

About Geonardo?

- Founded in 1999, Geonardo is an innovation and technology company active in the energy, environment and sustainable development fields.
- It's a Budapest-based SME with a strong focus on environment and innovation. We aim to solve complex societal challenges by providing cutting-edge solutions.
- In the context of EU R&D projects providing IT solutions is one of our key activities.

About the IT tool

- Field observation phase
- Laboratory analysis phase
- Monitoring phase
- Reporting phase

User roles

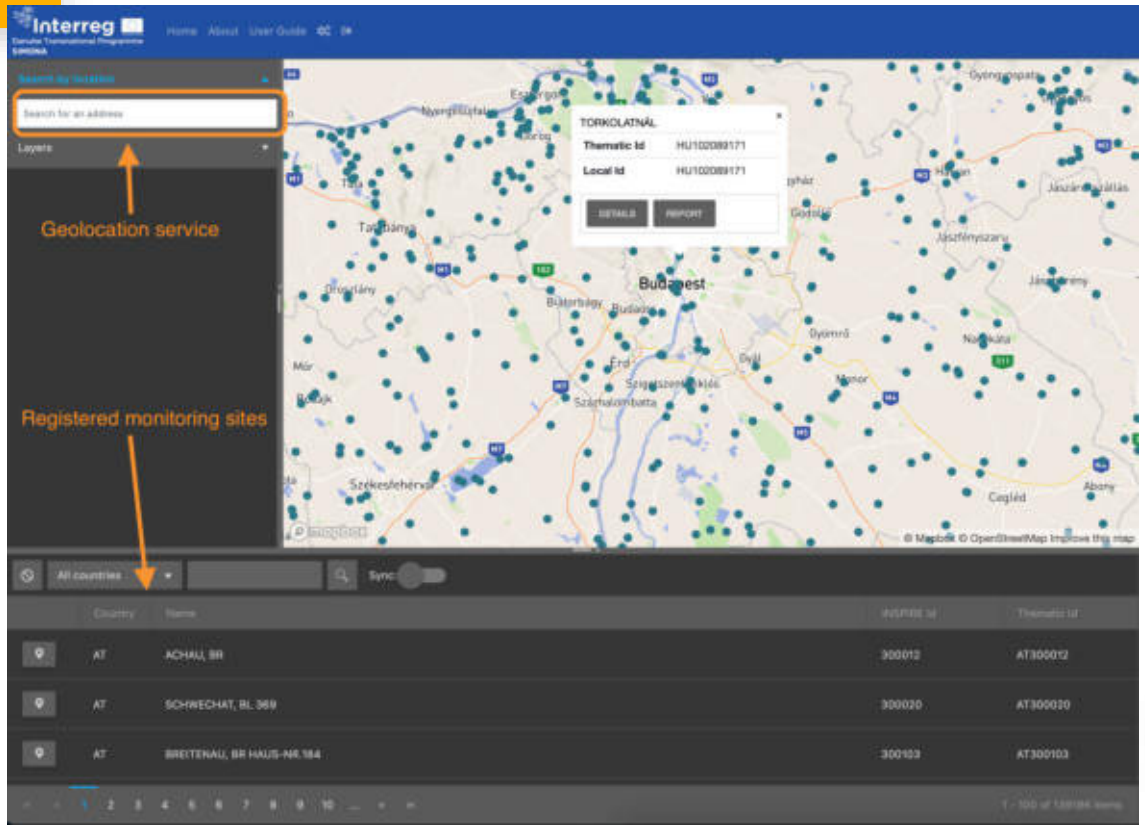
- Administrators
- Assistants
- Region managers
- National contacts
- Researchers
- Members
- Visitors

User stories

- Browsing publicly available data
- Monitoring site observations
- Submitting sediment sample data
- Upload laboratory results
- Data analysis
- Exporting WISE compatible reports

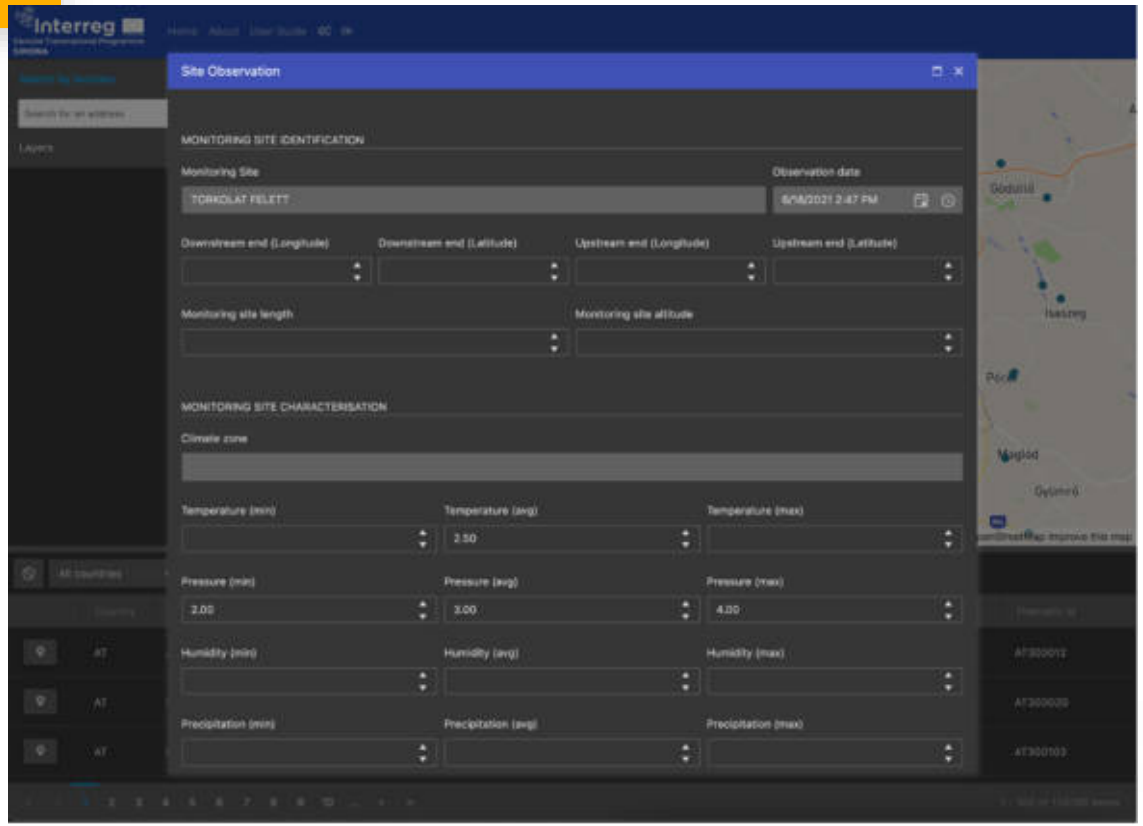
Browsing publicly available data

- Geolocation service for navigating by address
- Searchable database of registered monitoring sites
- Features on the map are associated to a popup



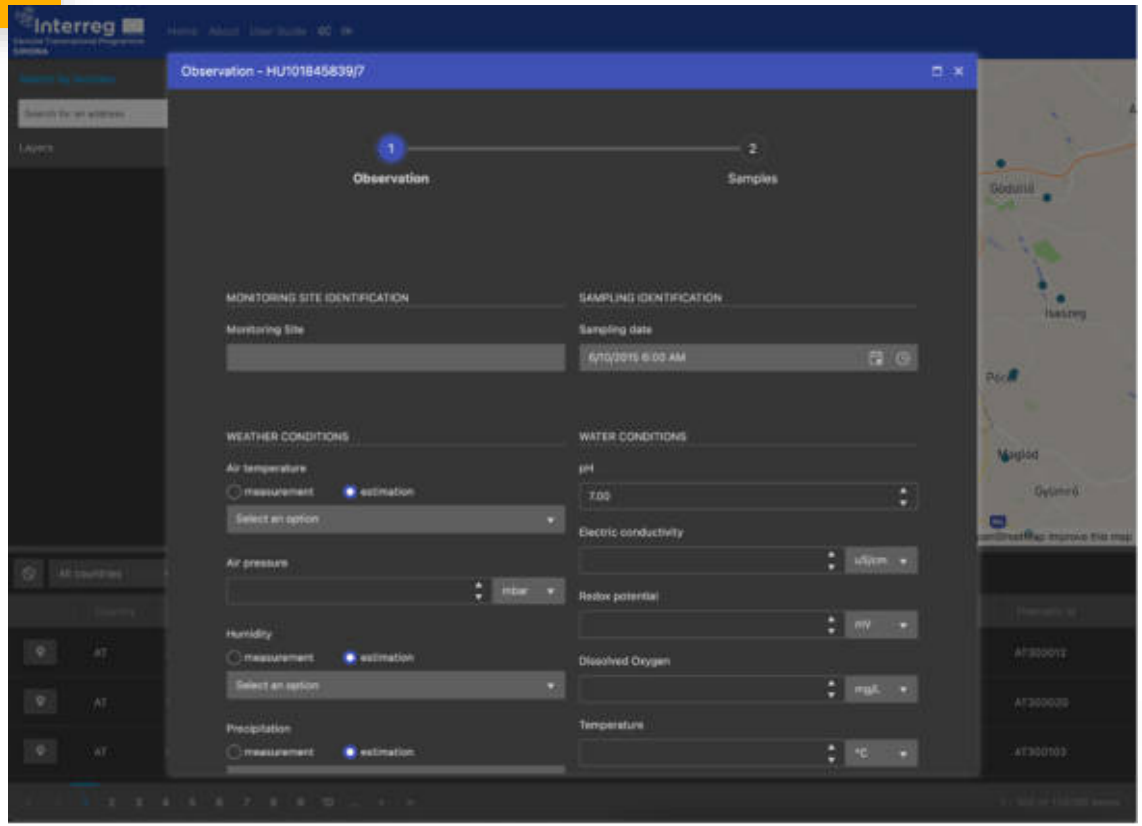
Monitoring site details

- On-site field observation
- Site identification supported by the GIS database
- Min/avg/max inputs for observed parameters



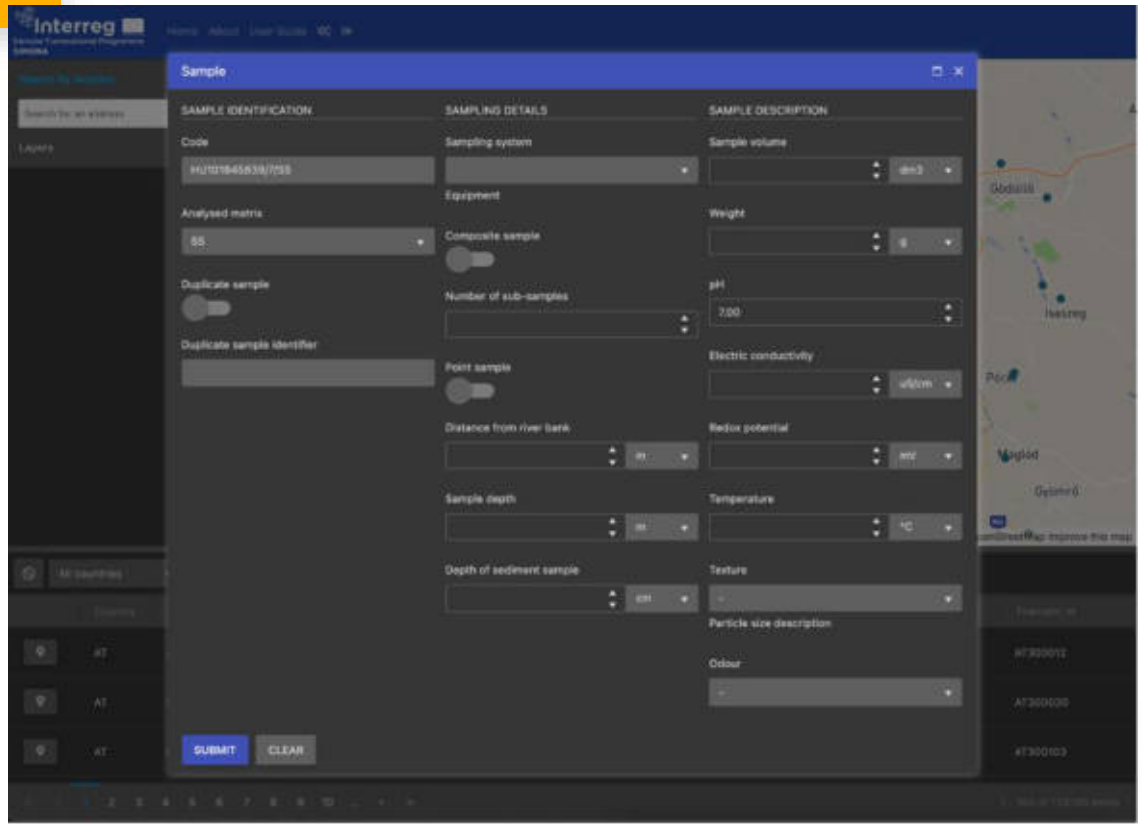
Submitting sediment sample data

- Sediment sampling data linked to a monitoring site
- Measured and estimated values under:
- Weather conditions
- Water conditions
- Sediment conditions



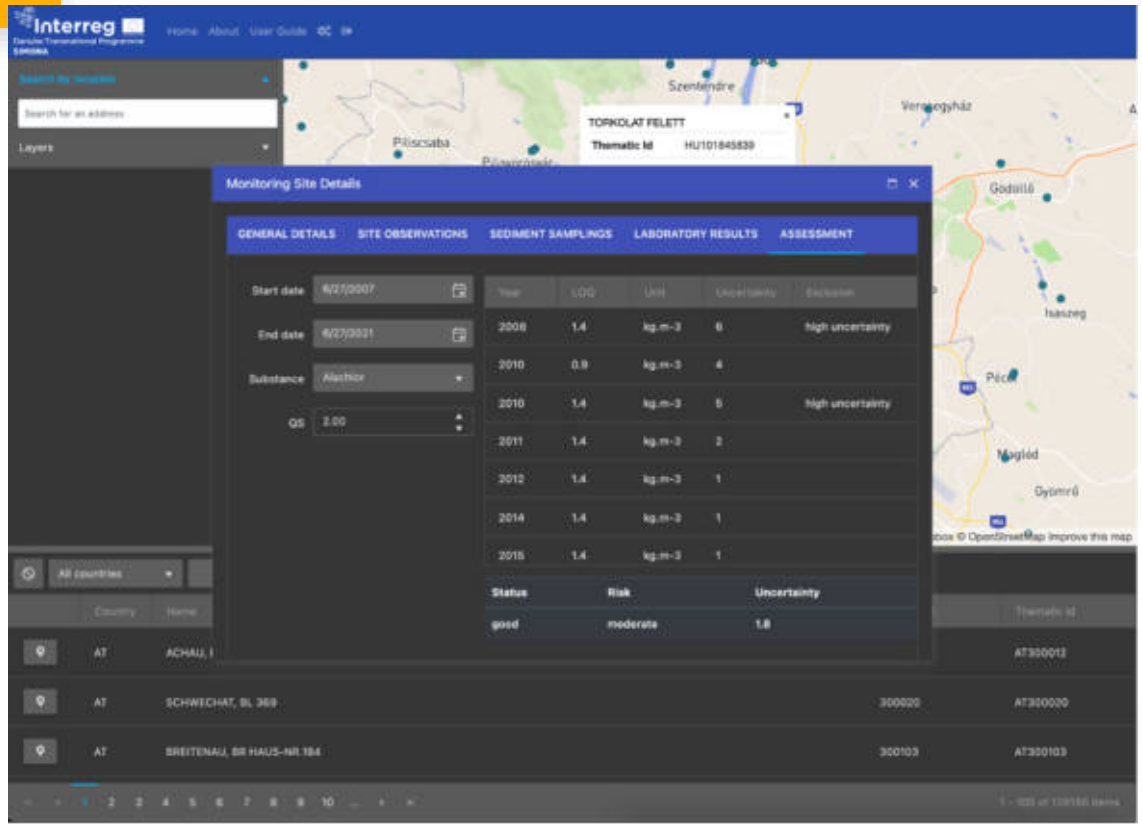
Submitting sediment sample data

- Sediment sample data linked to a specific sampling
- Internal sample identification
- Unit of measure conversion
- Arbitrary number of samples



Data analysis

- Status and risk classification
- Uncertainty assessment



Ongoing developments

- Field observation:
  - Uploading attachments to observations (e.g. photos)
- Data analysis:
  - Combined tabular presentation of risk assessment results
  - Visualisation of water quality assessment results on the map
- Reporting
  - WISE water quality report

Upcoming activities

- Testing phase is starting in July
- User manual
- Contact us at simona@geonardo.com

Interreg
Danube Transnational Programme
SIMONA

SIMONA Second Training Event

28 June 2021

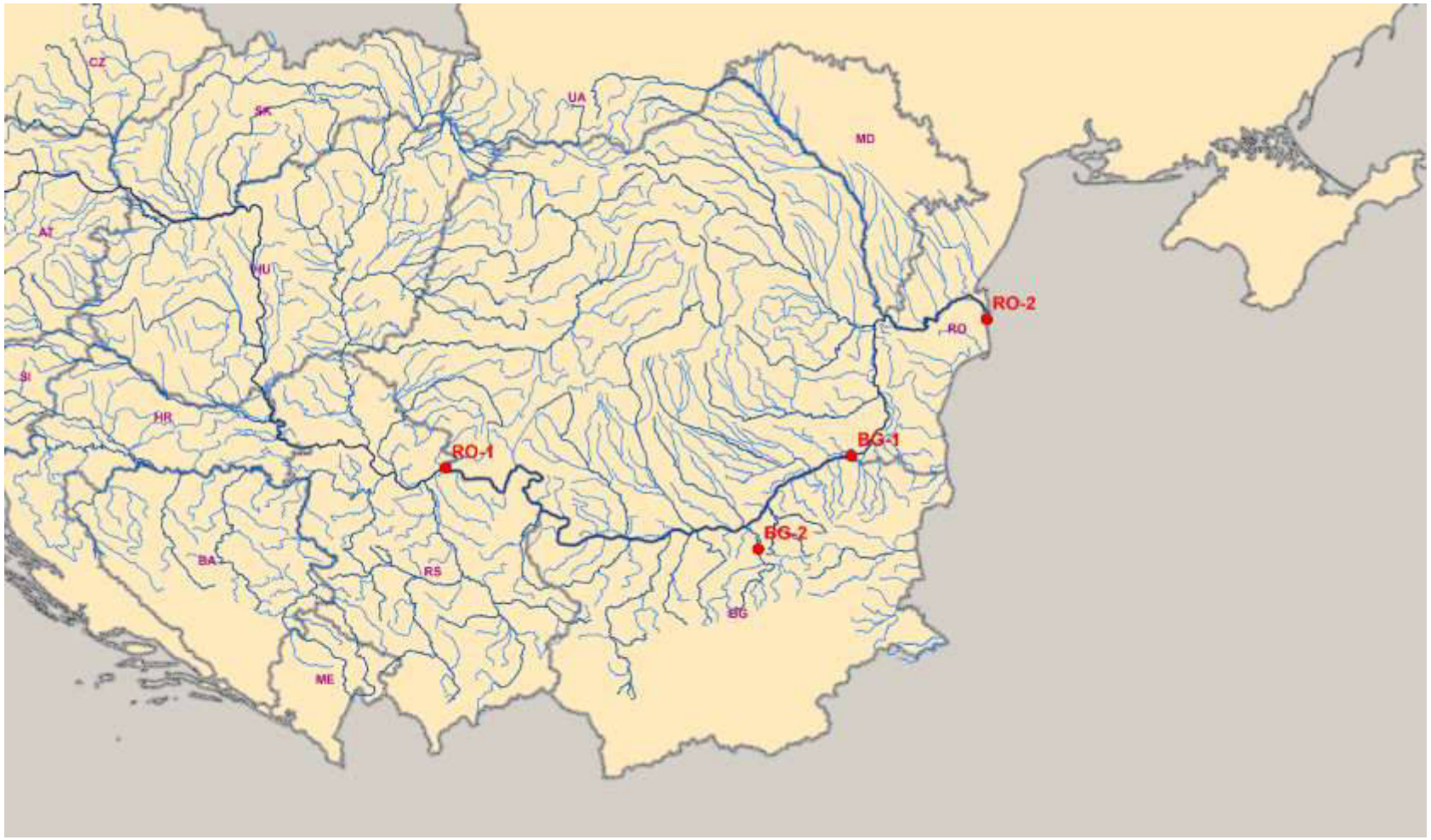
Baseline network sampling and laboratory analyses
SIMONA Case Studies RO/BG
Silistra - Calarasi Profile

Anca-Marina Vijdea (RO-IGR), Atanas Hikov (GI-BAS)

With contribution from:
Bulgaria: Irena Peycheva, Petyo Filipov, Zlatka Milakovska (GIBAS)
Romania: Albert Baltres (RO-IGR)

Project co-funded by the European Union
http://www.interreg-danube.eu/approved-projects/simona

BASELINE NETWORK SAMPLING STATIONS IN BULGARIA AND ROMANIA



SIMONA Second Training Event

Station Name	River Name	Site Name	WGS Long	WGS Lat	Suspended sediment	Bottom sediment	Floodplain sediment	Responsible for sampling	Comment
BG-01	Danube	Silistra (right bank)	44°7'27.78"N	27°16'0.534"E	yes	yes	Yes, TS and BS	GI-BAS	In collaboration with IGR and INHGA (RO) for the complete Danube section (center and left)
BG-02	Yantra	Karantsi	43°23' 12.98"N	25°40' 5.23"E	yes	yes	Yes, TS and BS	GI-BAS	
RO-01	Danube	Bazias	44°48'49.60"N	21°22'48.76"E	yes	yes	Yes, TS and BS	RO-IGR	Subcontracted to INHGA (RO) for suspended and bottom sediment
RO-02	Danube	Sulina	45°9'30.86"N	29°40'19.45"E	yes	yes	Yes, TS and BS	RO-IGR	Subcontracted to INHGA (RO) for suspended and bottom sediment

The Bulgarian and Romanian selected BN stations:

- BG-01: 1 transverse profile on Danube at Silistra – Calarasi (Chiciu); TNMN station
- BG-02: 1 sampling point on Yantra at Karantsi; TNMN station
- RO-01: 1 transverse profile on Danube at Bazias; TNMN station
- RO-02: 1 transverse profile on Danube at Sulina; TNMN station

SEDIMENT SAMPLING

A transverse profile on Danube was agreed for Silistra station at Sofia workshop, October 2019 by BG-GIBAS and RO-IGR.

Three verticals were measured on the Silistra – Calarasi (Chiciu) profile:

- Left (50 m away from the Danube Romanian bank)
- Center (middle of the river)
- Right (50 m away from the Bulgarian bank)

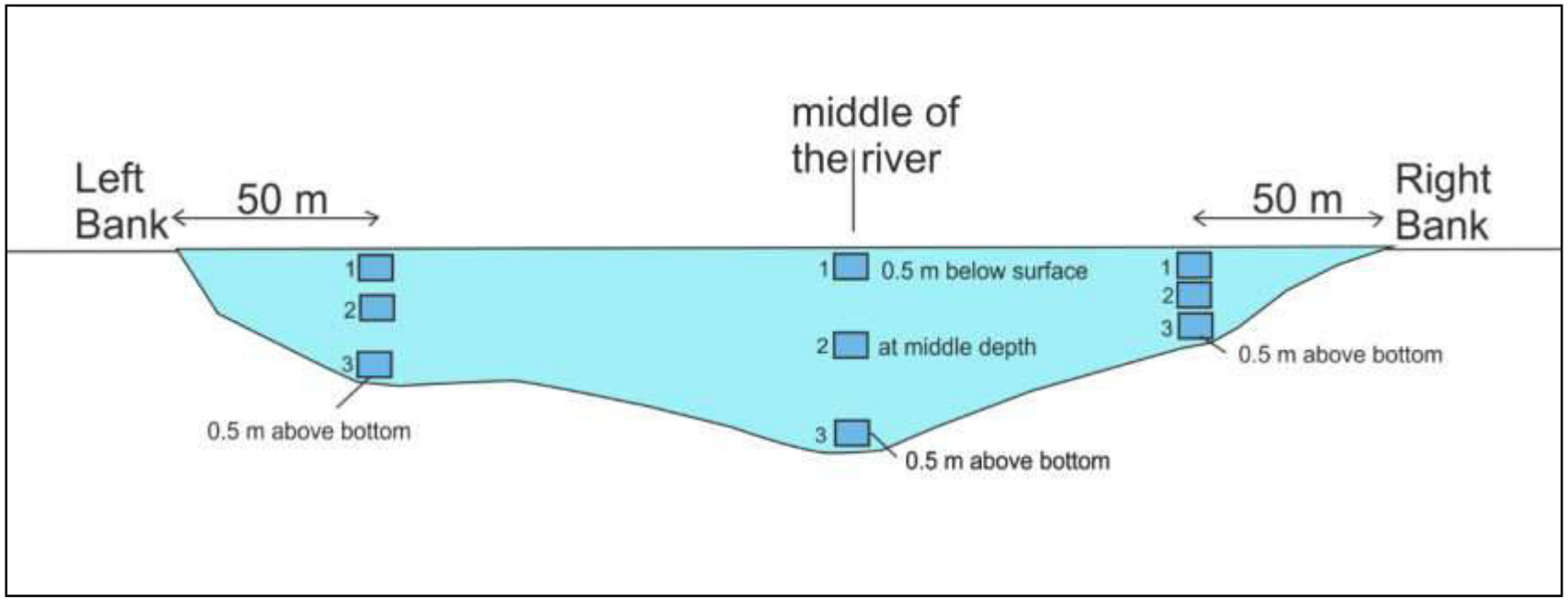
Additional – sampling on the right bank by GI-BAS team.

SEDIMENT SAMPLING

SUSPENDED SEDIMENTS

Subcontract by public procurement for suspended and bottom sediments sampling in the Danube by the Romanian partner, IGR (Geological Institute of Romania)

Contract won by accredited sampler, the National Institute for Hydrology and Water Management (INHGA)



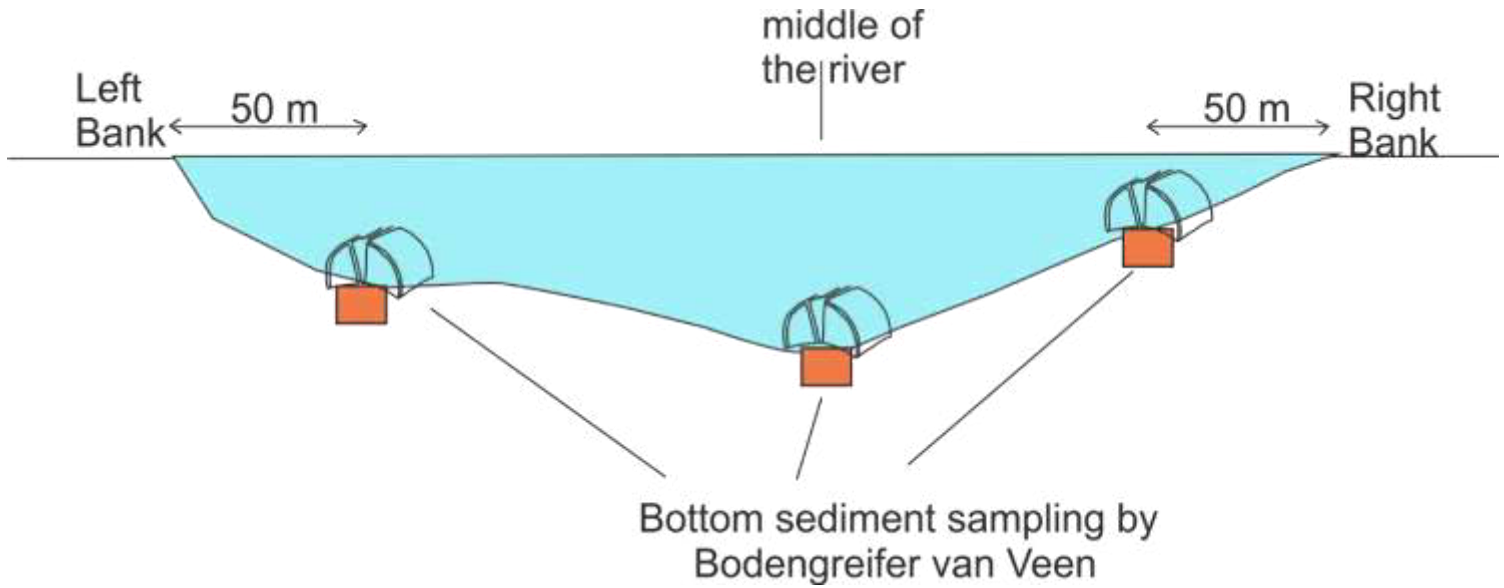
Three depths for collecting suspended sediments at each vertical (L, C, R):

- 0.5 m below water surface (30 L extracted)
- middle of the water depth (30 L extracted)
- 0.5 m above bottom (30 L extracted)

A composite sample (90 L) was left for settling and after 24 h or more, the suspended sediment and water were transferred into plastic bottles of 8 L or 10 L which were then sent for chemical analyses stored at 4 – 5 degrees C

SEDIMENT SAMPLING

BOTTOM SEDIMENTS



Fine sediments from the first 5 cm or so of the river bottom

SAMPLING EQUIPMENT FOR SUSPENDED AND BOTTOM SEDIMENTS IN THE DANUBE RIVER

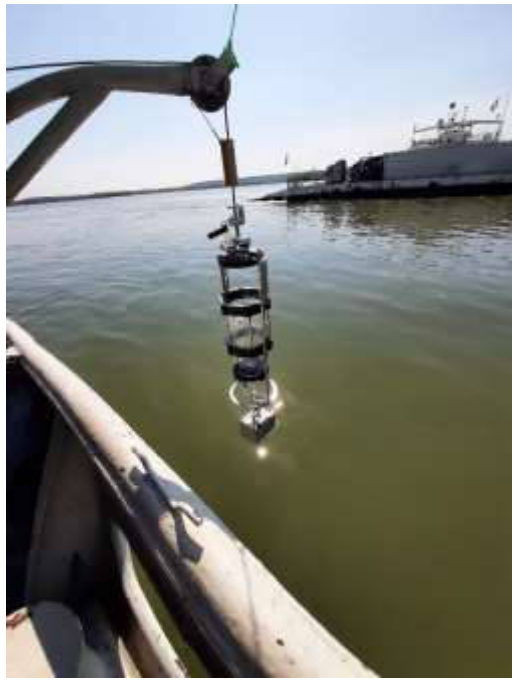
The ship for collecting suspended and bottom sediments in the Danube River, property of INHGA (National Institute for Hydrology and Water Management)

Sonar for river depth measurement on the command deck of the ship

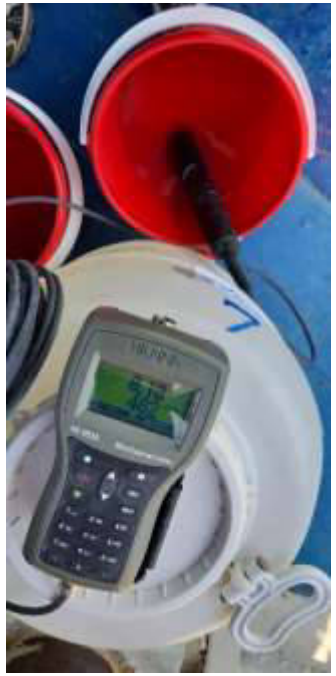
ADCP (Acoustic Doppler Current Profile) equipment for river width, depth and flow rate measurement

SAMPLING EQUIPMENT FOR SUSPENDED SEDIMENTS IN THE DANUBE RIVER

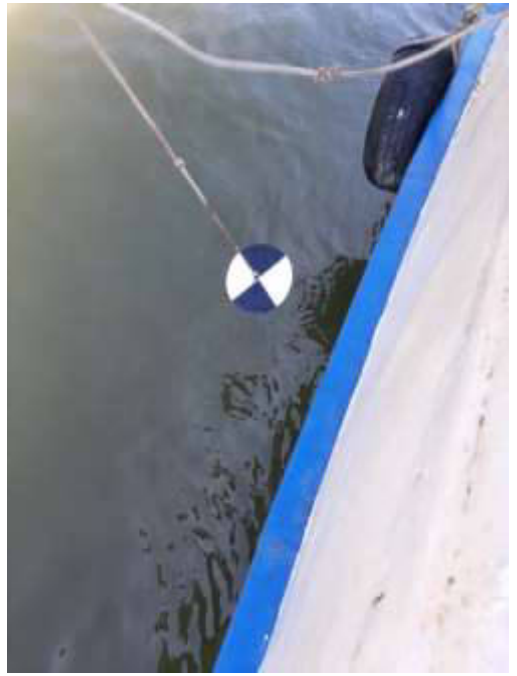
Telemeter for distance measurement between ship location and river bank



Ruttner bathometer for water properties measurements

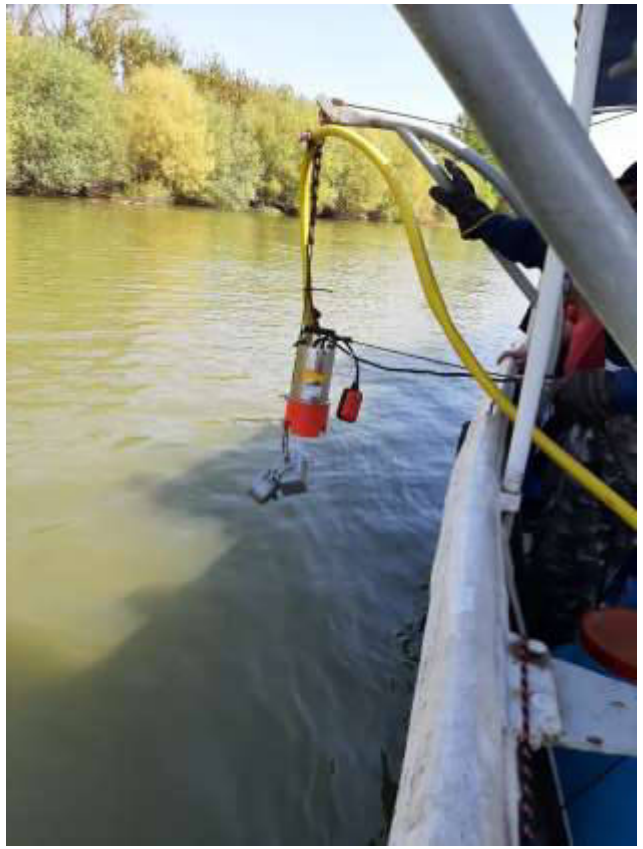


Hanna multi-parameter device (water pH, temperature, electric conductivity)



Secchi disk for water turbidity measurement

SAMPLING EQUIPMENTS FOR SUSPENDED SEDIMENTS IN THE DANUBE RIVER



Winch for launching submersible pump

Submersible pump (close view)

Filling one barrel with water containing suspended sediment from three depths in each vertical of the profile

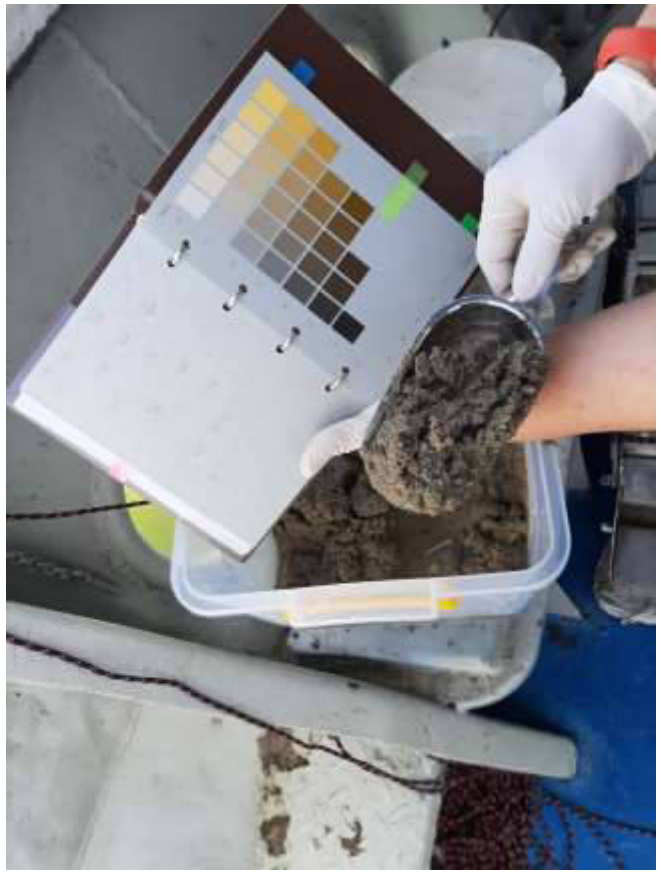
SAMPLING EQUIPMENTS FOR BOTTOM SEDIMENTS IN THE DANUBE RIVER

Van Veen grab in launching position

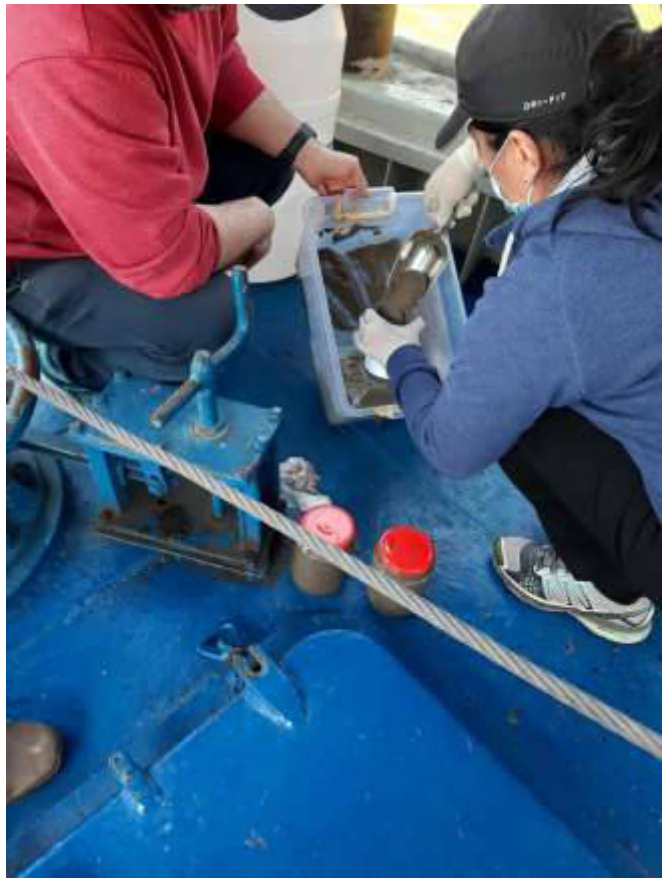
Discharging of Van Veen grab

Physical properties measurements of sampled sediment (pH, temperature)

SAMPLING EQUIPMENT FOR BOTTOM SEDIMENTS IN THE DANUBE RIVER



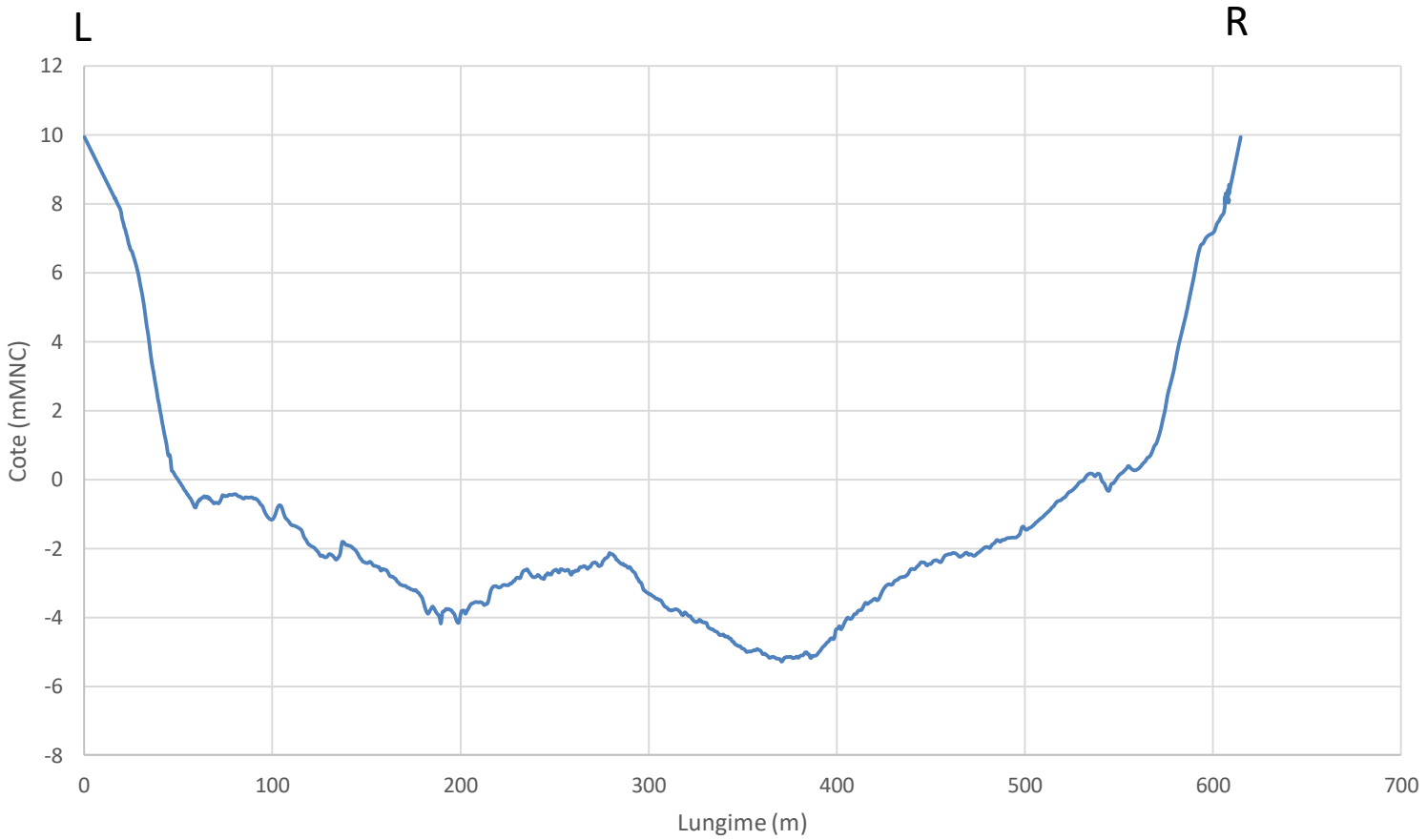
Munsell chart for sediment colour code



Filling the jars with bottom sediments

Three jars with bottom sediments from the right part of Silistra – Calarasi profile

BOTTOM RELIEF OF THE DANUBE RIVER IN SILISTRA – CALARASI (CHICIU) PROFILE



Ragged bottom relief revealed by Acoustic Doppler Current Profile (ADCP)

ADCP equipment

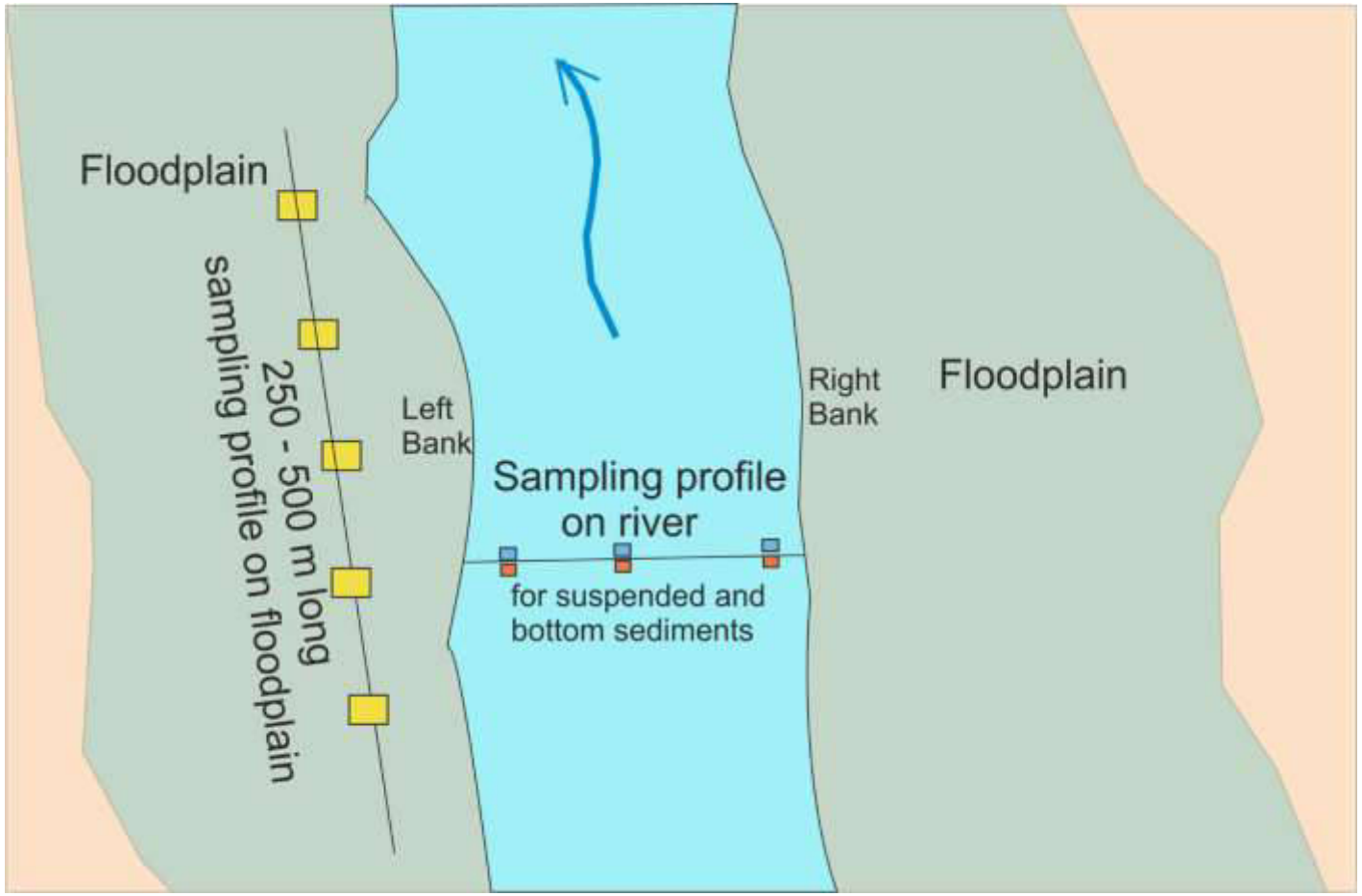
SEDIMENT SAMPLING

FLOODPLAIN SEDIMENTS

Sampled by RO-IGR (Geological Institute of Romania)

Floodplain sampled at two depths:

- Topsoil 0 – 5 cm depth
- Bottom soil 40 – 50 cm depth



Composite sample made up of 5 subsamples along the sampling profile

SEDIMENT SAMPLING

FLOODPLAIN SEDIMENTS

Floodplain of the left bank of the Danube River, at Chiciu (Calarasi), opposite Silistra

Two of the five holes sampled for floodplain sediments along the Chiciu profile

Five cm thick, dry sand topsoil, on 15 cm oxidized brownish sand covering 30 cm thick gray sandy loam

Brown sand covering finely laminated gray sandy loam

SEDIMENT STORING AND PREPARATION FOR TRANSPORT




DATA RECORDING IN SIMONA OBSERVATION SHEETS – SUSPENDED SEDIMENT

FIELD OBSERVATION SHEET FOR SEDIMENT SAMPLING

APPENDIX 3 OF THE SIMONA SEDIMENT QUALITY SAMPLING PROTOCOL

MONITORING PROGRAMME/ SAMPLING PROJECT INFORMATION:

Project name: SIMONA	**Sample identifier** (ID): ROSI-CL/SS/R
Collection date (DD/MM/YYYY): 26.04.2021	**Collection time** (HH:MM): 12:37
Sampling matrix: ☐ stream/bottom sediment; ☒ suspended sediment; ☐ other (floodplain sediment, ...)	
Sampling: ☒ accredited; ☐ not accredited	**Sampling standard**

MONITORING SITE IDENTIFICATION:

Monitoring Site ID (WISE-SoE): BG1DU000R001	**Monitoring Site ID** (national): BG1DU00999MS100R
Name of the Monitoring Site (e.g. name of the surface water and the city): Danube, Silistra_SITE (right bank)	
Sample location description with specific information (bridge, high power electric lines, railway line, major road, natural park, ...) (provide map on opposite side): Downstream Silistra Port Map and picture attached at the additional comments	
Type of the monitoring site (can be different from representing waterbody): ☒ river; ☐ lake; ☐ wetland; ☐ other (floodplain, ...):	
Aim of sampling: ☐ general status; ☐ reference site (without/small anthropogenic sources); ☐ investigation site – find contamination source; ☒ investigation site for other: Simona Project	

WGS84	Latitude:	**National Coordinate system**	Latitude:
	Longitude:		Longitude:

MONITORING SITE REPRESENTING THE FOLLOWING WATERBODY AND ITS BASIN:

Is it the same waterbody as the Monitoring Site has? ☒ YES or ☐ NO
If no, describe the connection between waterbody and monitoring site (tributary, recipient, ...):

Waterbody ID (WISE-SoE): BG1DU000R001	**Waterbody ID** (national): 6
Name of the Waterbody: R. Dunav_Pristanishte Gr. Silistra-Desen	
Type of the Waterbody: ☒ river; ☐ lake; ☐ wetland; ☐ coastal; ☐ transitional	

MONITORING SITE CONDITIONS (PART 1):

River width [m]: 600 ☐ estimated; ☒ measured value	**Depth of water** [m]: 8.5 ☐ estimated; ☒ measured depth	**Flow rate** [m³/s]: 6280 ☐ estimated; ☒ measured value
Water temperature [°C]: 13.0	**Water electrical conductivity** [µs/cm]: 462	
Water pH: 8.2	**Water transparency** (Secchi disk method) [cm]: 80	
Geology and background value of parent material/lithology in the area: Sarmatian limestone		

For further information on the SIMONA Sampling, Laboratory and Evaluation protocols, on the project, partnership and the Danube Transnational Programme: www.interreg-danube.eu/simona

MONITORING SITE CONDITIONS (PART II):

Extreme conditions: ☒ none; ☐ flooding status; ☐ ice; ☐ pollution plume; ☐ contaminated coast/bank; ☐ other:
Weather conditions: ☐ hot; ☒ sunny; ☐ cloudy; ☐ changeable; ☐ rainy; ☐ frosty

SEDIMENT COLLECTION INFORMATION:

Water depth above sample [m]: 0.5/ 4.25 / 8
Sediment sample depth [cm]:
Collection device: ☐ stainless steel scoop; ☐ corer; ☒ sampler for suspended sediment; ☒ other: submersible water pump
Sample type: ☒ composite – number of subsamples: 3
Distance between the first and last sampling site? [m]: 7.5
Sample replicate collected? ☐ YES or ☐ NO — Replicate ID/name:
Sample is duplicated? ☐ YES or ☐ NO

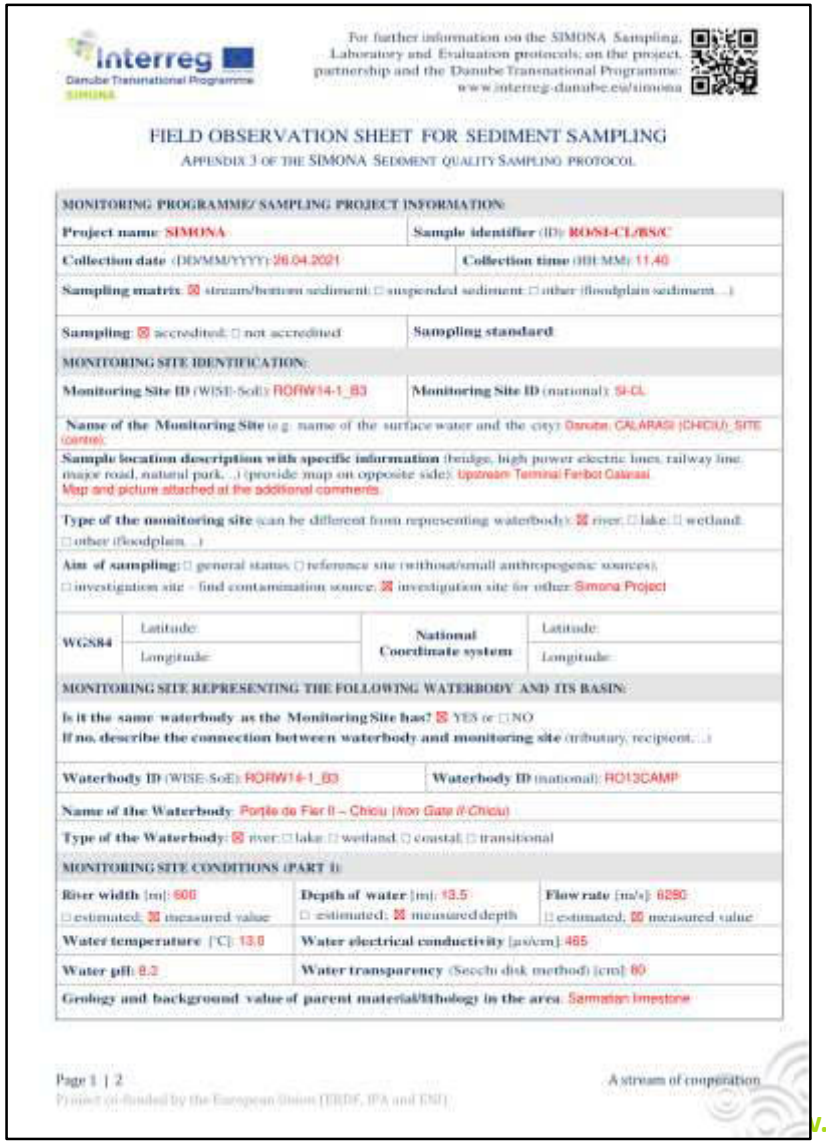
SAMPLE INFORMATION:

Sampling volume estimated, wet weight [liter]: 3 x 30 liter
Temperature of sample (field observation, right after sampling) [°C]: 13.0
Sediment pH (undisturbed) — **Sediment pH** (post-homogenization)
Colour (Munsell soil colour chart number):
Texture (particle size description):
Odour: ☐ none; ☐ light; ☐ strong; ☐ earthy; ☐ mildewed; ☐ putrid; ☐ farm slurry; ☐ fishy; ☐ aromatic; ☐ sewage; ☐ fuel/oil
Information on sediment components (seashells, animals, peat, wood, tar, stones, waste, plastics, etc.):
Sample photograph identification: Photo folder: Silistra_Clucu Calarasi
Additional comments (e.g. map of the sampling site):

Sampler name (readable): INHGA* team — **Signature:** C. Trifu — E. Luca

*National Institute of Hydrology and Water Management

DATA RECORDING IN SIMONA OBSERVATION SHEETS – BOTTOM SEDIMENT



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For further information on the SIMONA Sampling, Laboratory and Evaluation protocols, on the project, partnership and the Danube Transnational Programme: www.interreg-danube.eu/simona

FIELD OBSERVATION SHEET FOR SEDIMENT SAMPLING

APPENDIX 3 OF THE SIMONA SEDIMENT QUALITY SAMPLING PROTOCOL

MONITORING PROGRAMME/ SAMPLING PROJECT INFORMATION:

Project name: SIMONA | **Sample identifier** (ID): RO/SI-CL/BS/C

Collection date (DD/MM/YYYY): 26.04.2021 | **Collection time** (HH:MM): 11.40

Sampling matrix: ☒ stream/bottom sediment; ☐ suspended sediment; ☐ other (floodplain sediment,...)

Sampling: ☒ accredited; ☐ not accredited | **Sampling standard**

MONITORING SITE IDENTIFICATION:

Monitoring Site ID (WISE-SoE): RORW14-1_83 | **Monitoring Site ID** (national): SI-CL

Name of the Monitoring Site (e.g. name of the surface water and the city): Danube, CALARASI (CHICIU), SITE (centre);

Sample location description with specific information (bridge, high power electric lines, railway line, major road, natural park, ...) (provide map on opposite side): Upstream Terminal Feribot Calarasi
Map and picture attached at the additional comments

Type of the monitoring site (can be different from representing waterbody): ☒ river; ☐ lake; ☐ wetland; ☐ other (floodplain, ...)

Aim of sampling: ☐ general status; ☐ reference site (without/small anthropogenic sources); ☐ investigation site – find contamination source; ☒ investigation site for other: Simona Project

WGS84	Latitude:	National Coordinate system	Latitude:
	Longitude:		Longitude:

MONITORING SITE REPRESENTING THE FOLLOWING WATERBODY AND ITS BASIN:

Is it the same waterbody as the Monitoring Site has? ☒ YES or ☐ NO
If no, describe the connection between waterbody and monitoring site (tributary, recipient, ...):

Waterbody ID (WISE-SoE): RORW14-1_83 | **Waterbody ID** (national): RO13CAMP

Name of the Waterbody: Portile de Fier II – Chiciu (Iron Gate II-Chiciu)

Type of the Waterbody: ☒ river; ☐ lake; ☐ wetland; ☐ coastal; ☐ transitional

MONITORING SITE CONDITIONS (PART I):

River width [m]: 600 ☐ estimated; ☒ measured value | **Depth of water** [m]: 13.5 ☐ estimated; ☒ measured depth | **Flow rate** [m/s]: 6280 ☐ estimated; ☒ measured value

Water temperature [°C]: 13.0 | **Water electrical conductivity** [µs/cm]: 485

Water pH: 8.2 | **Water transparency** (Secchi disk method) [cm]: 80

Geology and background value of parent material/lithology in the area: Sarmatian limestone

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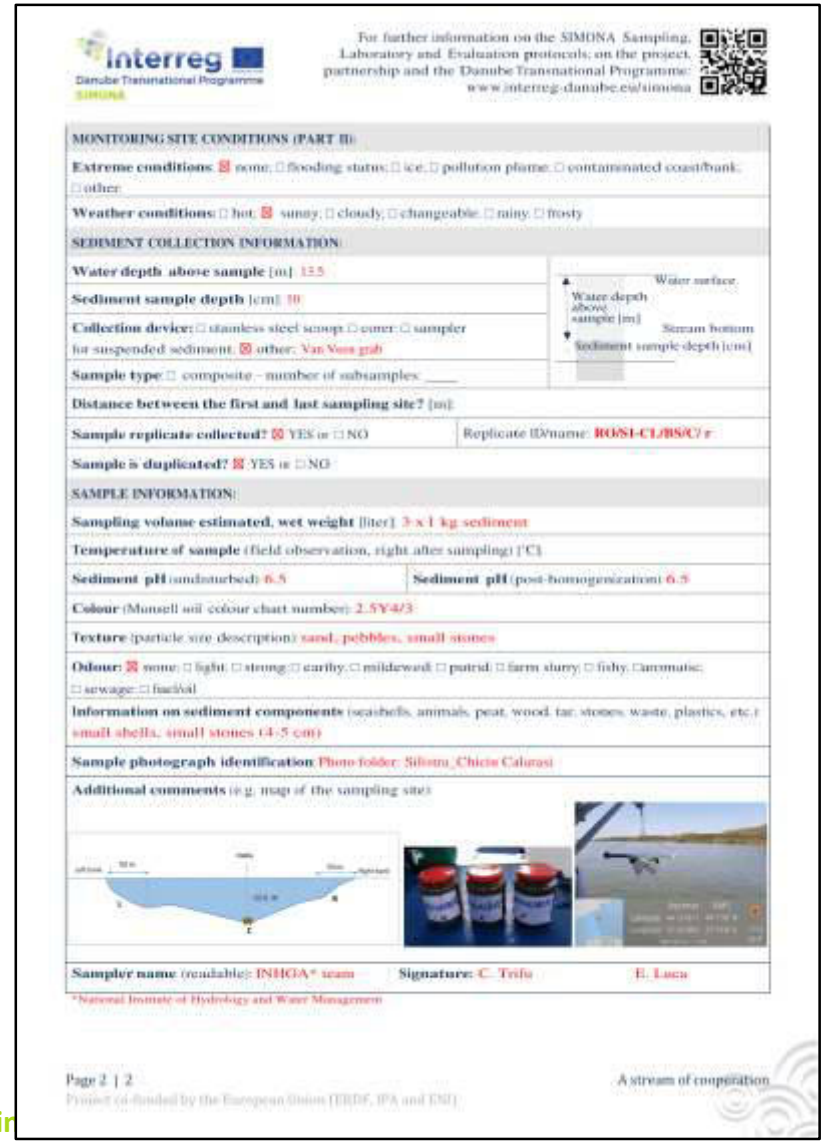

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For further information on the SIMONA Sampling, Laboratory and Evaluation protocols, on the project, partnership and the Danube Transnational Programme: www.interreg-danube.eu/simona

MONITORING SITE CONDITIONS (PART II):

Extreme conditions: ☒ none; ☐ flooding status; ☐ ice; ☐ pollution plume; ☐ contaminated coast/bank; ☐ other:

Weather conditions: ☐ hot; ☒ sunny; ☐ cloudy; ☐ changeable; ☐ rainy; ☐ frosty

SEDIMENT COLLECTION INFORMATION:

Water depth above sample [m]: 13.5

Sediment sample depth [cm]: 10

Collection device: ☐ stainless steel scoop; ☐ corer; ☐ sampler for suspended sediment; ☒ other: Van Veen grab

Sample type: ☐ composite – number of subsamples: ____

Water surface
Water depth above sample [m]
Stream bottom
Sediment sample depth [cm]

Distance between the first and last sampling site? [m]:

Sample replicate collected? ☒ YES or ☐ NO | Replicate ID/name: RO/SI-CL/BS/C/ r

Sample is duplicated? ☒ YES or ☐ NO

SAMPLE INFORMATION:

Sampling volume estimated, wet weight [liter]: 3 x 1 kg sediment

Temperature of sample (field observation, right after sampling) [°C]:

Sediment pH (undisturbed): 6.5 | **Sediment pH** (post-homogenization): 6.5

Colour (Munsell soil colour chart number): 2.5Y4/3

Texture (particle size description): sand, pebbles, small stones

Odour: ☒ none; ☐ light; ☐ strong; ☐ earthy; ☐ mildewed; ☐ putrid; ☐ farm slurry; ☐ fishy; ☐ ammoniac; ☐ sewage; ☐ fecal/oil

Information on sediment components (seashells, animals, peat, wood, tar, stones, waste, plastics, etc.): small shells, small stones (4-5 cm)

Sample photograph identification: Photo folder: Silistra_Chicin Calarasi

Additional comments (e.g. map of the sampling site):

Sampler name (readable): INHGA* team | **Signature:** C. Trifu | E. Luca

*National Institute of Hydrology and Water Management

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SEDIMENT SAMPLING ON THE RIGHT BANK OF THE DANUBE RIVER – SILISTRA OLD PORT

SIMONA GI-BAS TEAM

View of the sampling site – the right bank of the Danube River – Silistra old port

Equipment before starting the sampling

SEDIMENT SAMPLING ON THE RIGHT BANK OF THE DANUBE RIVER – SILISTRA OLD PORT

BOTTOM SEDIMENTS

Collection of bottom sediments with a scoop

SUSPENDED SEDIMENTS

Collection of suspended sediments with a 20 l barrel

SEDIMENT SAMPLING ON THE RIGHT BANK OF THE DANUBE RIVER – SILISTRA OLD PORT

FLOODPLAIN SEDIMENTS

Three 50-cm holes were sampled for:

- *Bottom soil – 40-50 cm*
- *Top soil – 0-5 cm*

Burying the holes after finishing the sampling

SEDIMENT SAMPLING ON THE RIGHT BANK OF THE DANUBE RIVER – SILISTRA OLD PORT

IN SITU MEASUREMENTS

Measuring the water turbidity with Secchi disk

Taking in situ measurements (water pH, temperature, electric conductivity)

SEDIMENT SAMPLING ON THE RIGHT BANK OF THE DANUBE RIVER – SILISTRA OLD PORT

SAMPLE STORING AND TRANSPORT

Composite samples collected from the Danube at Silistra sampling site with sample identification

Collected samples are stored in mobile refrigerator (cool box)

CONCLUSIONS AFTER THE SAMPLING CAMPAIGN

SUSPENDED SEDIMENTS

- In the Danube River 90 L of water containing fine suspended sediment was collected from 3 depths in each vertical. Later the water was reduced to 8 - 10 L, assuming that a sufficient quantity of sediment could be available for analyses oh heavy metals, PAHs and pesticides.
- For future monitoring purpose it is recommended to use on the boat a **portable centrifuge** coupled with the submerged pump, which will allow the extraction of suspended sediments from greater amounts of water (4 – 5 m^3), therefore enough sediment for the chemical analyses.
- A passive sampler for suspended sediments is tested on the pontoon on the Danube river next to our hotel.

BOTTOM SEDIMENTS

- In the Danube, the Van Veen grab is suitable for sampling sediment from the river bottom. The sampling is not easy, sometimes in the planned location no sample could be collected after several tries. If the grab hits a larger stone or a rocky bottom, the collected sediment is scarce or none. In some locations the device recovered mainly pebbles and shells. In these cases, it is necessary to repeat the sampling.
- The corer samplers are very suitable for bottom sediments and it will be good to compare the results from grab and corer samplers.

CONCLUSIONS AFTER THE SAMPLING CAMPAIGN

FLOODPLAIN SEDIMENTS

- In the SEDIMENT QUALITY SAMPLING PROTOCOL FOR HSS there are only RECOMMENDATIONS for the MONITORING of ACTIVE FLOODPLAIN sediments. The prescribed sampling depth for floodplain sediments in the FOREGS Atlas 0–25 cm was used for all points of SDTA. The sampling of bottom soil (40–50 cm) is good for the first sampling to accumulate a database. For monitoring of these sites the sampling of top soil (0–5/0–10 cm) will be enough.

- Different sampling equipment as corer and auger samplers can be used also to sample the top soil of floodplain sediments.

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DRB Baseline Network CROATIA

Ajka Šorša, Danijel Ivanišević, Ana Čaić Janković, Lidija Galović, Ivan Mišur
Croatian Geological Survey

Đorđa Medić, Jasmina Antolić, Neven Bujas
Croatian Waters

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SIMONA 2nd Training Event, 28th June 2021, Hybrid -Online

Project co-funded by the European Union http://www.interreg-danube.eu/approved-projects/simona

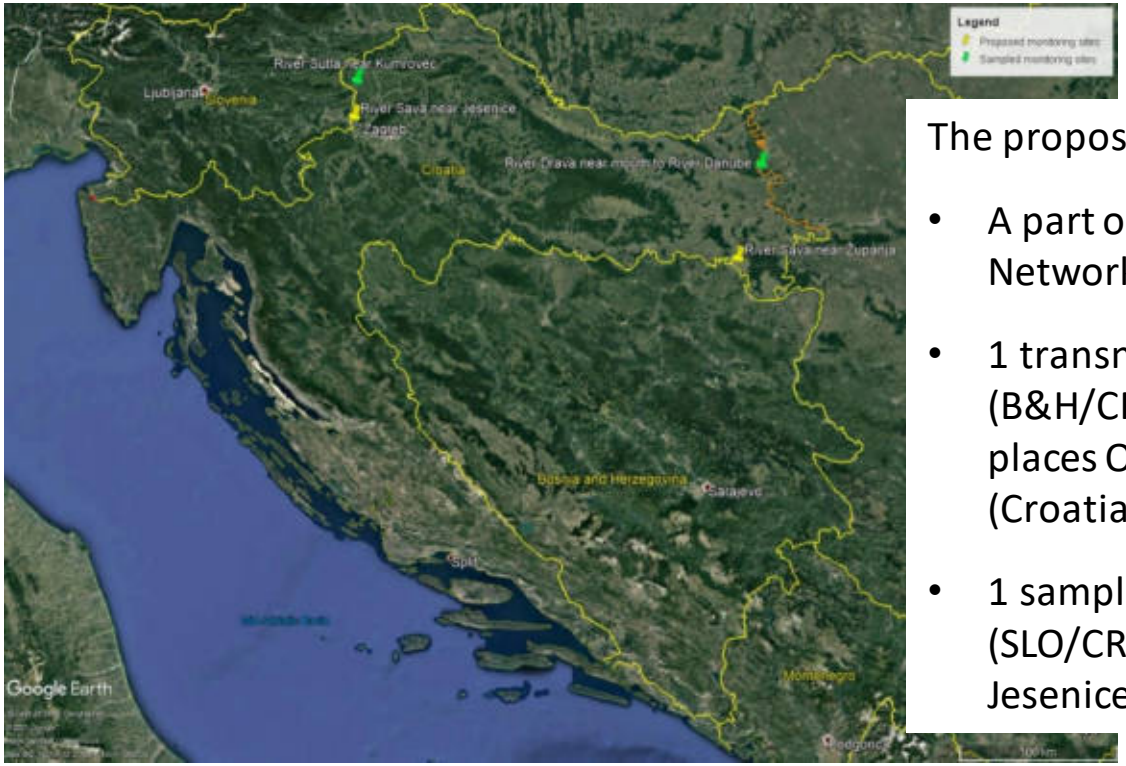
DRB Baseline Network CROATIA

- The fieldwork was carried out by SIMONA teams from the PP Croatian Geological Survey (HR-HGI-CGS) and the ASP Croatian Waters (HR-CW-HV) on the **12th – 14th April 2021**.
- Collected samples were stored and transported in refrigerator to the Bálint Laboratory in Hungary on the **15th of April 2021**.

Sampling sites for DRB baseline network were selected according to the following major criteria:

- Transnational character;
- Covering river of different size;
- Existing sediment/water monitoring sites;
- Diverse pollution sources;
- Good infrastructure.

DRB Baseline Network CROATIA



The proposed sampling sites:

- A part of the Trans National Monitoring Network (TNMN);
- 1 transnational sampling point/transect (B&H/CRO) on the Sava River near places Orašje (B&H) and Županja (Croatia);
- 1 sampling point at the border (SLO/CRO) on the Sava River near places Jesenice (Slovenia) and Drenje (Croatia).

Sampling stations in Croatia (yellow marked are old proposed sites, green marked are newly proposed and sampled sites)

Responsible for monitoring:
Croatian Waters.

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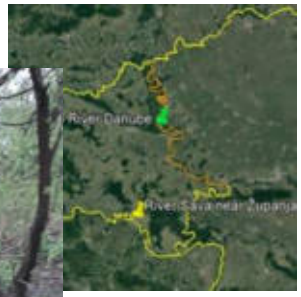

The proposed monitoring sampling sites: **River Sava near Županja** at the CRO/B&H border

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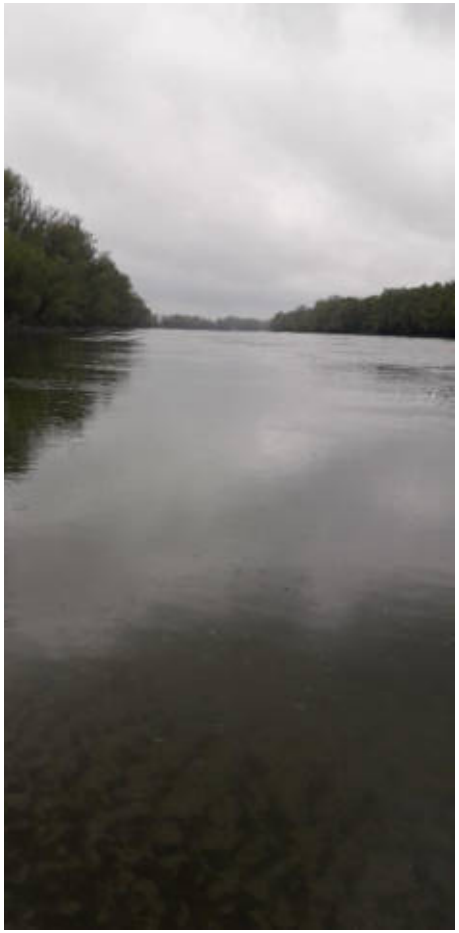

The newly arranged monitoring sampling site on the River Drava near the **confluence of the River Drava and River Danube** at the border of Croata and Serbia

Project co-funded by the European Union

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The proposed monitoring sampling sites: **River Sava near Jesenice** at the CRO/SLO border

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The new determined monitoring sampling site on the **River Sutla** at the border of Croatia and Slovenia

Project co-funded by the European Union

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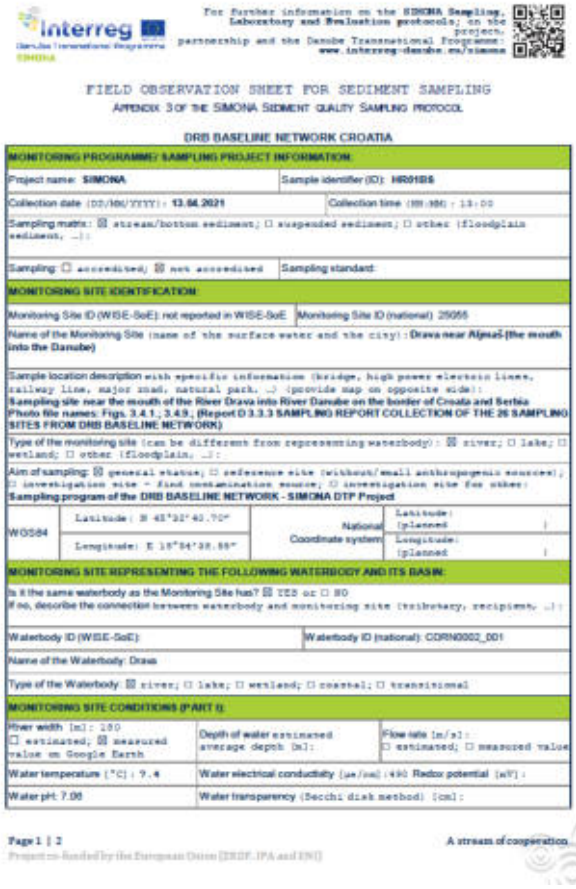
Washing sampling equipment

Samples prepared for transport

DRB Baseline Network CROATIA

Field observation sheet - filled out



For further information on the SIMONA Sampling, Laboratory and Evaluation protocols, on the project partnership and the Danube Transnational Programme: www.interreg-danube.eu/simona

FIELD OBSERVATION SHEET FOR SEDIMENT SAMPLING

APPENDIX 3 OF THE SIMONA SEDIMENT QUALITY SAMPLING PROTOCOL

DRB BASELINE NETWORK CROATIA

MONITORING PROGRAMME/ SAMPLING PROJECT INFORMATION:

Project name: **SIMONA**	Sample identifier (ID): **HR01BS**
Collection date (DD/MM/YYYY): **13.04.2021**	Collection time (HH:MM): 13:00
Sampling matrix: ☒ stream/bottom sediment; ☐ suspended sediment; ☐ other (floodplain sediment, ...):	
Sampling: ☐ accredited; ☒ not accredited	Sampling standard:

MONITORING SITE IDENTIFICATION:

Monitoring Site ID (WISE-SoE): not reported in WISE-SoE	Monitoring Site ID (national): 29055
Name of the Monitoring Site (name of the surface water and the city): **Drava near Aljmaš (the mouth into the Danube)**	
Sample location description with specific information (bridge, high power electric lines, railway line, major road, natural park, ...) (provide map on opposite side): **Sampling site near the mouth of the River Drava into River Danube on the border of Croatia and Serbia Photo file names: Figs. 3.4.1., 3.4.9., (Report D 3.3.3 SAMPLING REPORT COLLECTION OF THE 26 SAMPLING SITES FROM DRB BASELINE NETWORK)**	
Type of the monitoring site (can be different from representing waterbody): ☒ river; ☐ lake; ☐ wetland; ☐ other (floodplain, ...):	
Aim of sampling: ☒ general status; ☐ reference site (without/small anthropogenic sources); ☐ investigation site - find contamination source; ☐ investigation site for other: **Sampling program of the DRB BASELINE NETWORK - SIMONA DTP Project**	
WGS84 Latitude: N 45°32'40.70" / Longitude: E 18°54'38.88"	National Coordinate system: Latitude: (planned) / Longitude: (planned)

MONITORING SITE REPRESENTING THE FOLLOWING WATERBODY AND ITS BASIN:

Is it the same waterbody as the Monitoring Site has? ☒ YES or ☐ NO
If no, describe the connection between waterbody and monitoring site (tributary, recipient, ...):

Waterbody ID (WISE-SoE):	Waterbody ID (national): CDRN0002_001
Name of the Waterbody: Drava	
Type of the Waterbody: ☒ river; ☐ lake; ☐ wetland; ☐ coastal; ☐ transitional	

MONITORING SITE CONDITIONS (PART I):

River width (m): 180 ☐ estimated; ☒ measured value on Google Earth	Depth of water estimated average depth (m):	Flow rate (m/s): ☐ estimated; ☐ measured value
Water temperature (°C): 9.4	Water electrical conductivity (µs/cm): 490	Redox potential (mV):
Water pH: 7.08	Water transparency (Secchi disk method) (cm):	

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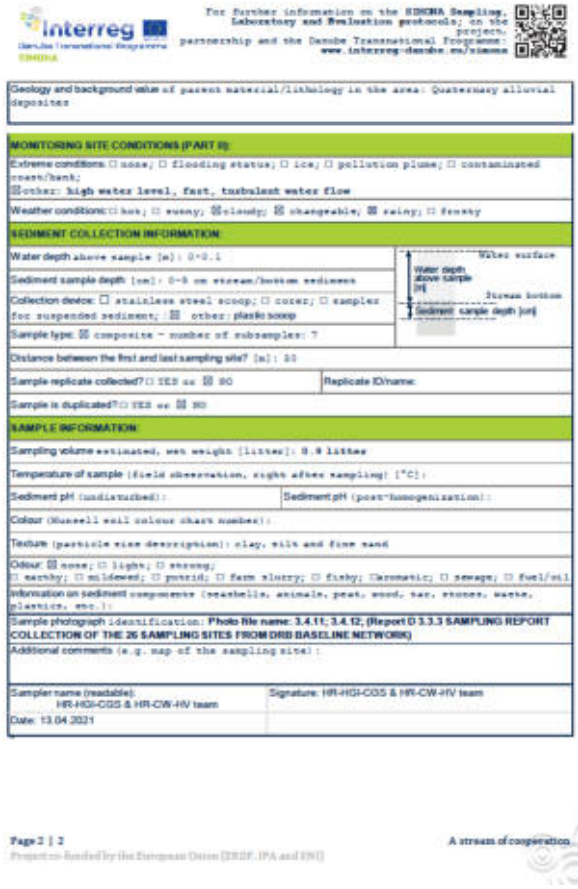

For further information on the SIMONA Sampling, Laboratory and Evaluation protocols, on the project partnership and the Danube Transnational Programme: www.interreg-danube.eu/simona

Geology and background value of parent material/lithology in the area: Quaternary alluvial deposites

MONITORING SITE CONDITIONS (PART II):

Extreme conditions: ☐ none; ☐ flooding status; ☐ ice; ☐ pollution plume; ☐ contaminated coast/bank;
☒ other: **high water level, fast, turbulent water flow**

Weather conditions: ☐ sun; ☐ sunny; ☒ cloudy; ☒ changeable; ☒ rainy; ☐ frosty

SEDIMENT COLLECTION INFORMATION:

Water depth above sample (m): 0-0.1

Sediment sample depth (cm): 0-5 cm stream/bottom sediment

Collection device: ☐ stainless steel scoop; ☐ corer; ☐ sampler for suspended sediment; ☒ other: plastic scoop

Sample type: ☒ composite - number of subsamples: 7

Distance between the first and last sampling site? (m): 50

Sample replicate collected? ☐ YES or ☒ NO — Replicate ID/name:

Sample is duplicated? ☐ YES or ☒ NO

SAMPLE INFORMATION:

Sampling volume estimated, wet weight (litres): 0.8 litres

Temperature of sample (field observation, right after sampling) (°C):

Sediment pH (undisturbed): — Sediment pH (post-homogenization):

Colour (Munsell soil colour chart number):

Texture (particle size description): clay, silt and fine sand

Odour: ☒ none; ☐ light; ☐ strong;
☐ earthy; ☐ mildewed; ☐ putrid; ☐ farm slurry; ☐ fishy; ☐ aromatic; ☐ sewage; ☐ fuel/oil

Information on sediment components (seashells, animals, peat, wood, tar, stones, waste, plastic, etc.):

Sample photograph identification: **Photo file name: 3.4.11; 3.4.12; (Report D 3.3.3 SAMPLING REPORT COLLECTION OF THE 26 SAMPLING SITES FROM DRB BASELINE NETWORK)**

Additional comments (e.g. map of the sampling site):

Sampler name (readable): HR-HGI-CGS & HR-CW-HV team	Signature: HR-HGI-CGS & HR-CW-HV team
Date: 13.04.2021	

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Problems/obstacles:

- the growing number of positive **COVID-19** cases;
- poor **weather** conditions;
- **deadline** according to the SIMONA project.

- The proposed sampling sites should be sampled **in cooperation** with colleges from Slovenia and Bosnia and Herzegovina.
- Since the goal of the project is to show **the sampling procedure** for different types of sediment, the sampling was carried out at the backup locations, on the Rivers Sutla and Drava with active participation of the ASP Croatian Waters.

DRB Baseline Network CROATIA

Sampling team:

from the HR-HGI-CGS

(from left side):

Danijel Ivanišević,

Ana Čaić Janković,

Ajka Šorša,

and from the HR-CW-HV

Neven Bujas,

Đorđa Medić,

Jasmina Antolić

Interreg
Danube Transnational Programme
SIMONA

Contacts

- Croatian Geological Survey (Croatia)
  - Ana Čaić Janković acaic@hgi-cgs.hr
  - Ajka Šorša asorsa@hgi-cgs.hr; ajkasorsa@gmail.com
  - Danijel Ivanišević divanisevic@hgi-cgs.hr
  - Ivan Mišur imisur@hgi-cgs.hr
  - Lidija Galović lgalovic@hgi-cgs.hr
- Croatian Waters (Croatia)
  - Đorđa Medić dorda.medic@voda.hr
  - Jasmina Antolić jasmina.antolic@voda.hr
  - Neven Bujas Neven.Bujas@voda.hr
- Waters of Srpska (Bosnia and Herzegovina)
  - Aleksandra Kovačević akovacevic@voders.org
  - Jelena Vićanović jvicanovic@voders.org

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JAVNA USTANOVA "VODE SRPSKE"

Thank You for Your Attention!

SIMONA 2nd Training Event, 28th June 2021, Hybrid -Online

Project co-funded by the European Union
http://www.interreg-danube.eu/approved-projects/simona


Czech
Hydrometeorological
Institute

Sediment sampling at national sampling points – CZ

Libor Mikl, *Jarmila Halířová,* *Vít Kodeš*

Czech Hydrometeorological Institute

Introduction:

- Sampling points were selected with respect to different quality of sediments from the different natural condition or land use
- Bečva River – represent foothill river, dominant proportion is **gravelly sand**
- Morava River – drains a large area, main proportion is **fine sand**
- agriculture land use

„fine sediment“ in Morava River

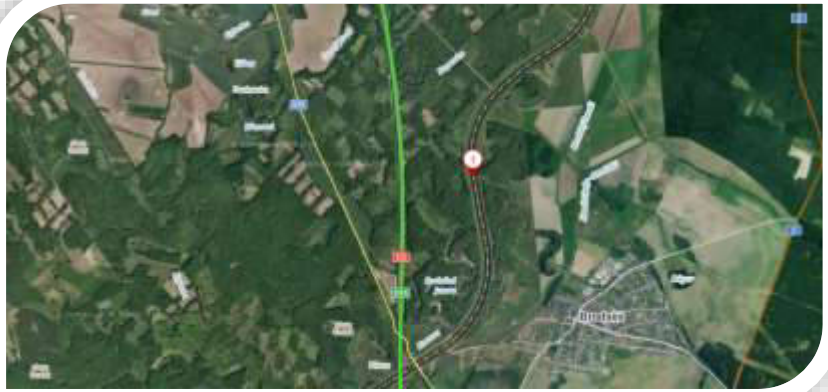
„coarse sediment“ in Bečva River

Sampling points:

minor differences of land use between both localities, however dominant land use at whole river basin is agriculture

Morava River – Lanžhot

river width 65.0 m



agriculture and floodplain forest

Bečva River – Troubky

river width 49.8 m

agriculture

Introduction:

- SIMONA **#1st** training event and „cookbook/guidebook“ was useful for us ☺
- we learned a lot to each other – knowledge sharing ☺
- especially that part about floodplain sediments ☺
- we have similar sampling methods of bottom sediments such as SIMONA
- However, we use the **grab samplers** to collect sediment samples, at some places and sometimes and in some cases

Equipment:

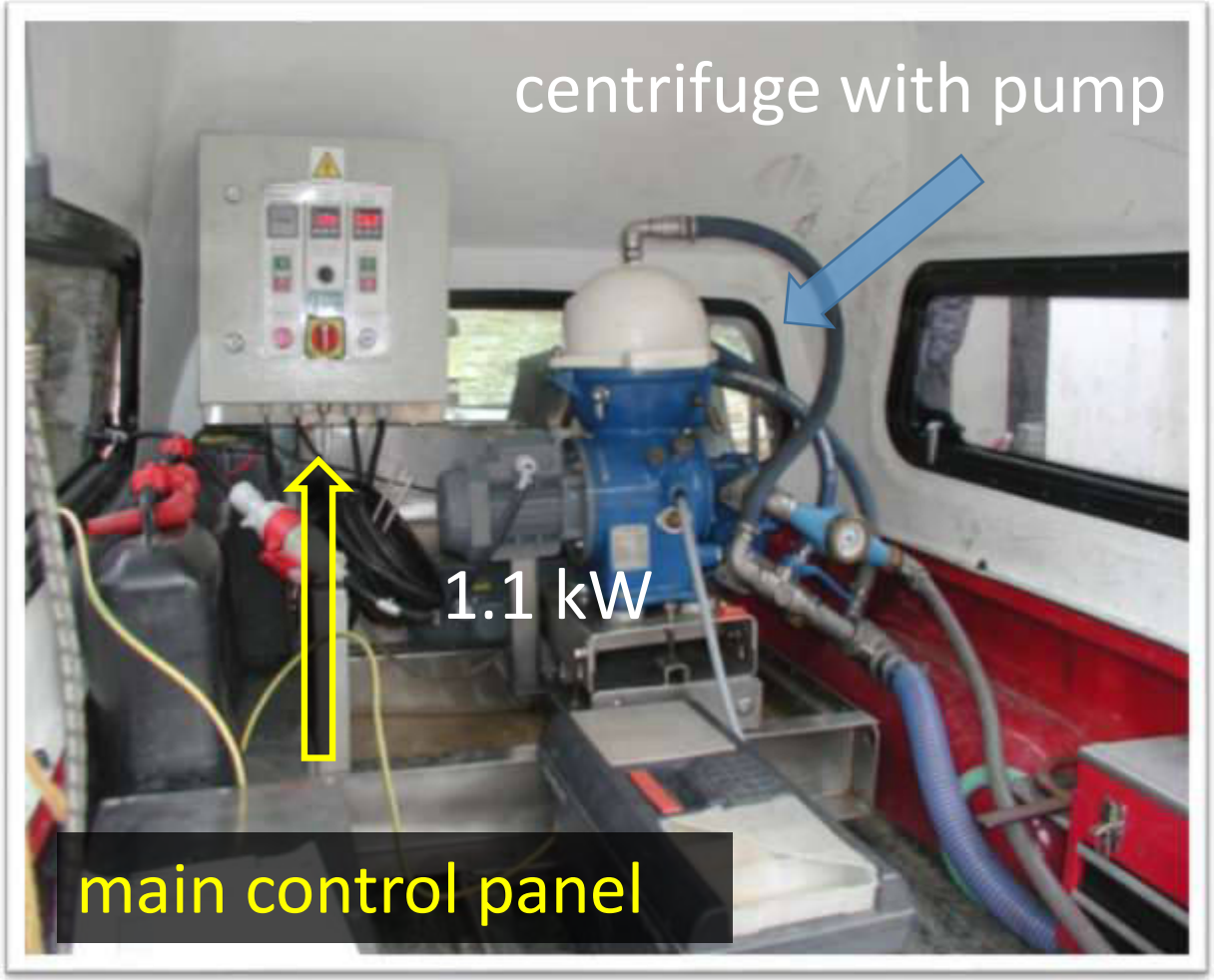
„grab samplers“

But we did not use it, during collection of sediment samples for SIMONA

Equipment:

- Barrel
- Stainless scope
- conductivity meter with temperature sensor
- Vessel for samples of sediments
- Spade
- centrifuge

Equipment - centrifuge



 # speed motor shaft ~ 1500 r/min., max. speed bowl ~ 7500 r/min.

Equipment - centrifuge

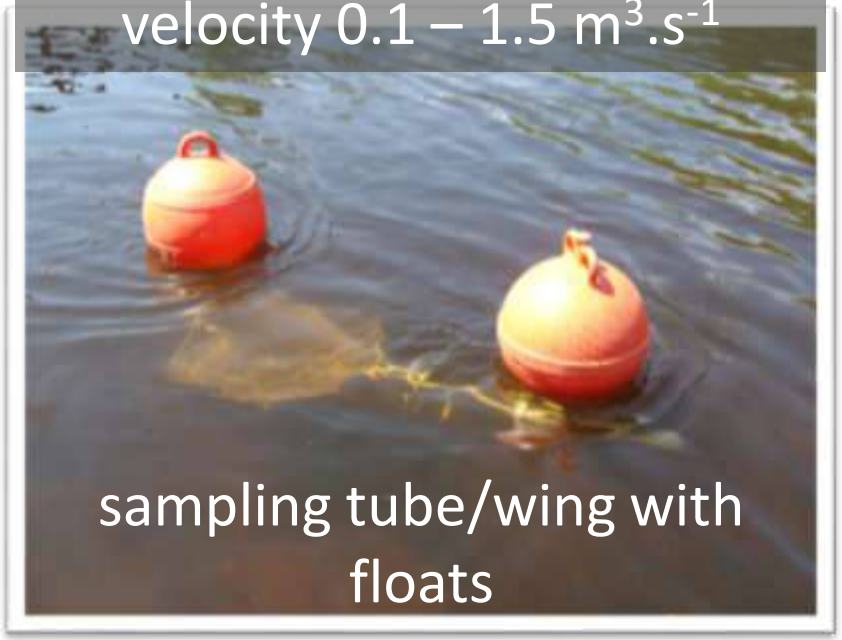
„heart of centrifuge“

collection containers with lamellas

sample

suction attachments/heads

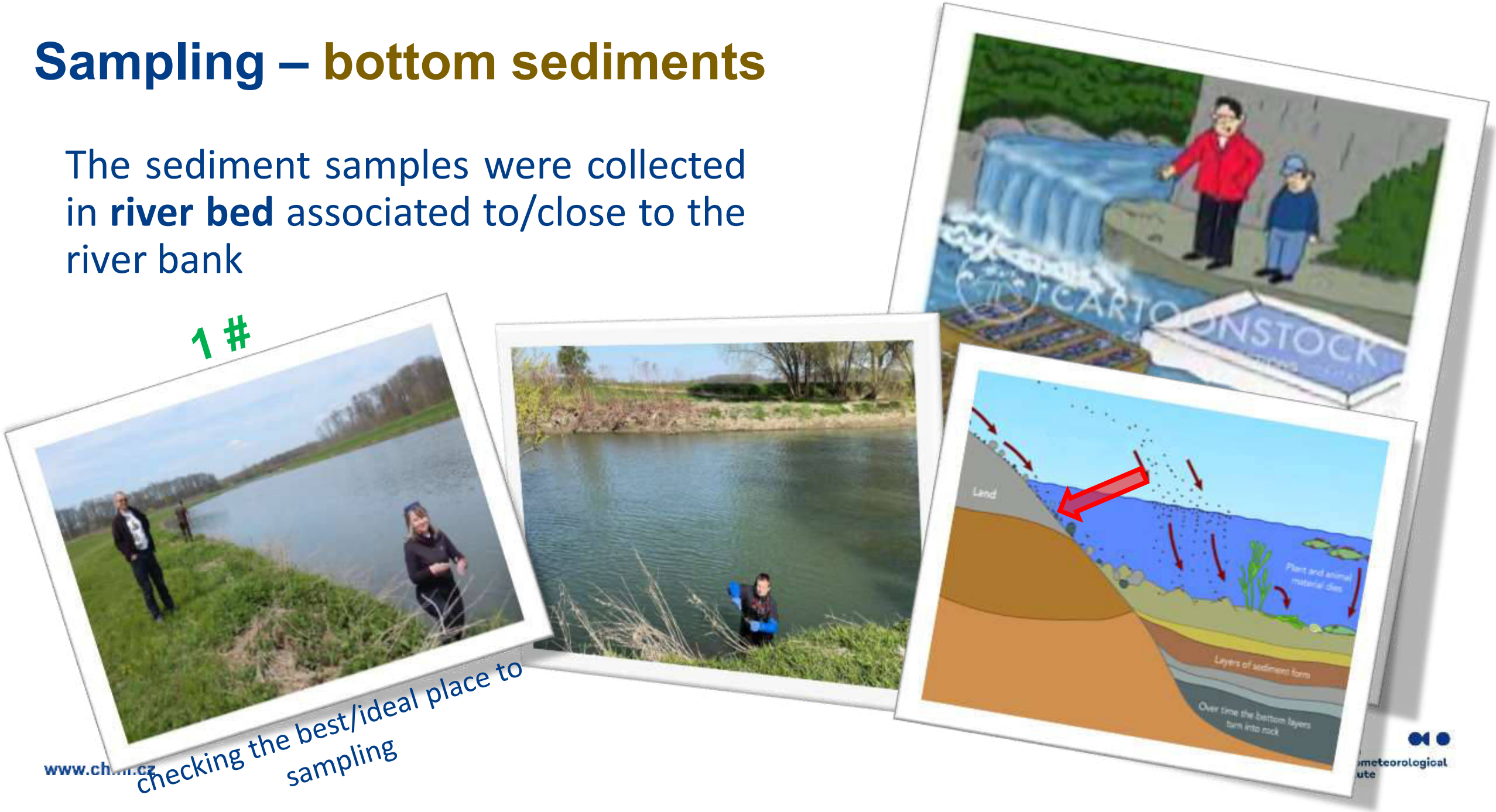
the different size depend to velocity 0.1 – 1.5 $m^3.s^{-1}$



sampling tube/wing with floats

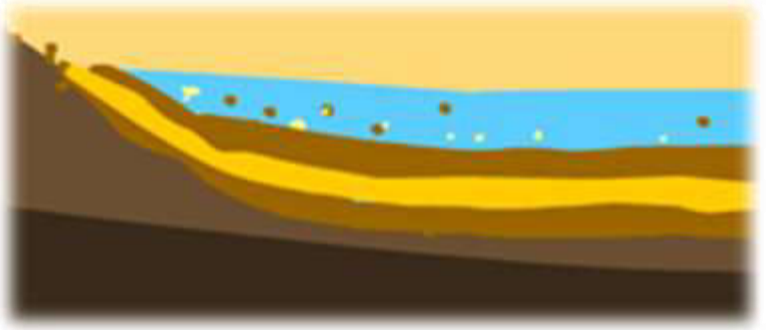
Sampling – bottom sediments

The sediment samples were collected in **river bed** associated to/close to the river bank



checking the best/ideal place to sampling

Sampling – bottom sediments



Top 5 cm of river sediment

for SIMONA

glass jar

for CHMI

stainless steel bowl

Sampling – floodplain sediments

digging of soil probe

finishing of the digging and checking the depth

final check

sample collection

Sampling – suspended sediments

12 V pump

prepare to sampling, such as hose flushing

sampling into barrel

Sampling – suspended sediments (centrifuge)

part I.

installation of the sampling tube with suction head

prepare to sampling

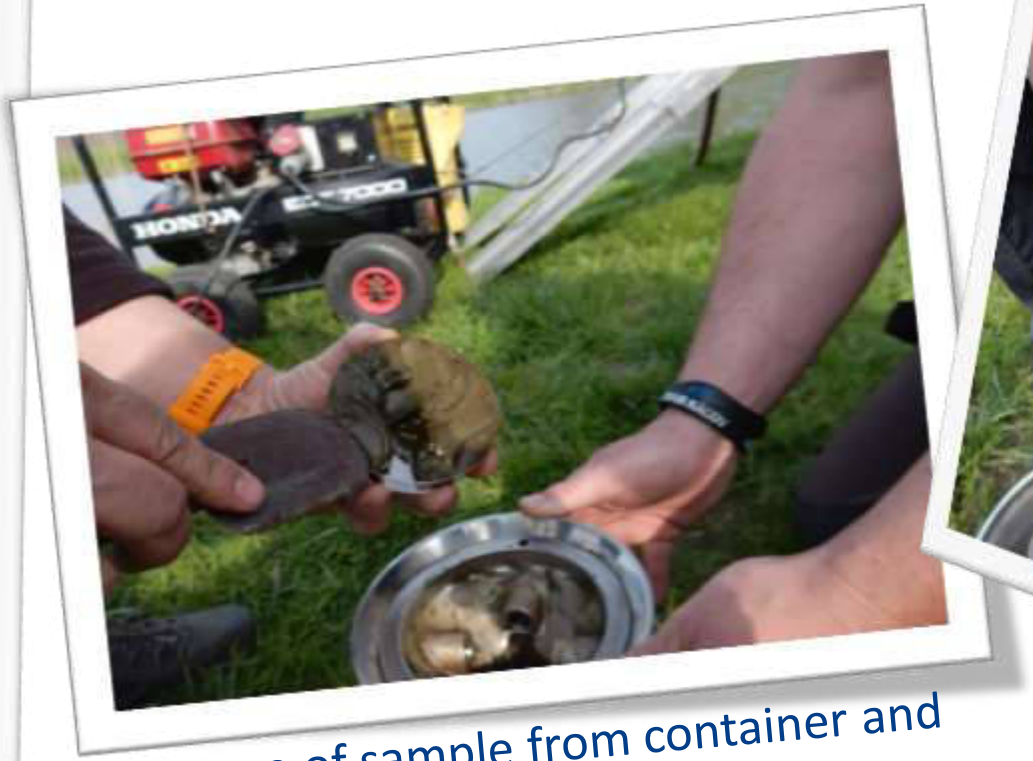
sampling and measure of basic parameter such as, temperature, pH, velocity and turbidity

 # the knowledge of turbidity is necessary to estimate the sampling time, which ranges from 1 to 8h

Sampling – suspended sediments (centrifuge)

part II.

thin layer of sample, on wall of collection container



remove of sample from container and lamellas

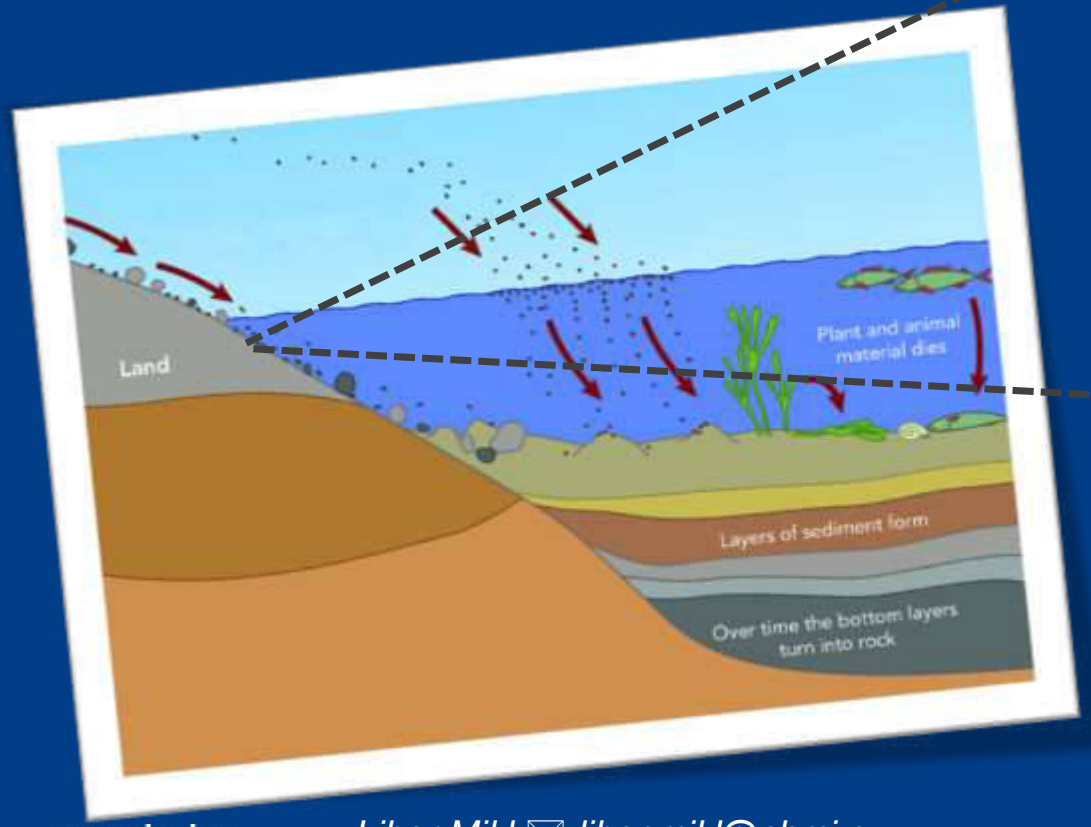
sample of suspended sediment in the vessel

Transport of sample

- The samples were coated in foam foil – **anti-break** protection
- The samples were stored in a car fridge during transport
- the car fridge has 2 different slots, for regular socket (220V) or car socket

Thank you for your attention ☺

party in sediment



Czech Hydrometeorological Institute

let's go check the party…

www.chmi.cz

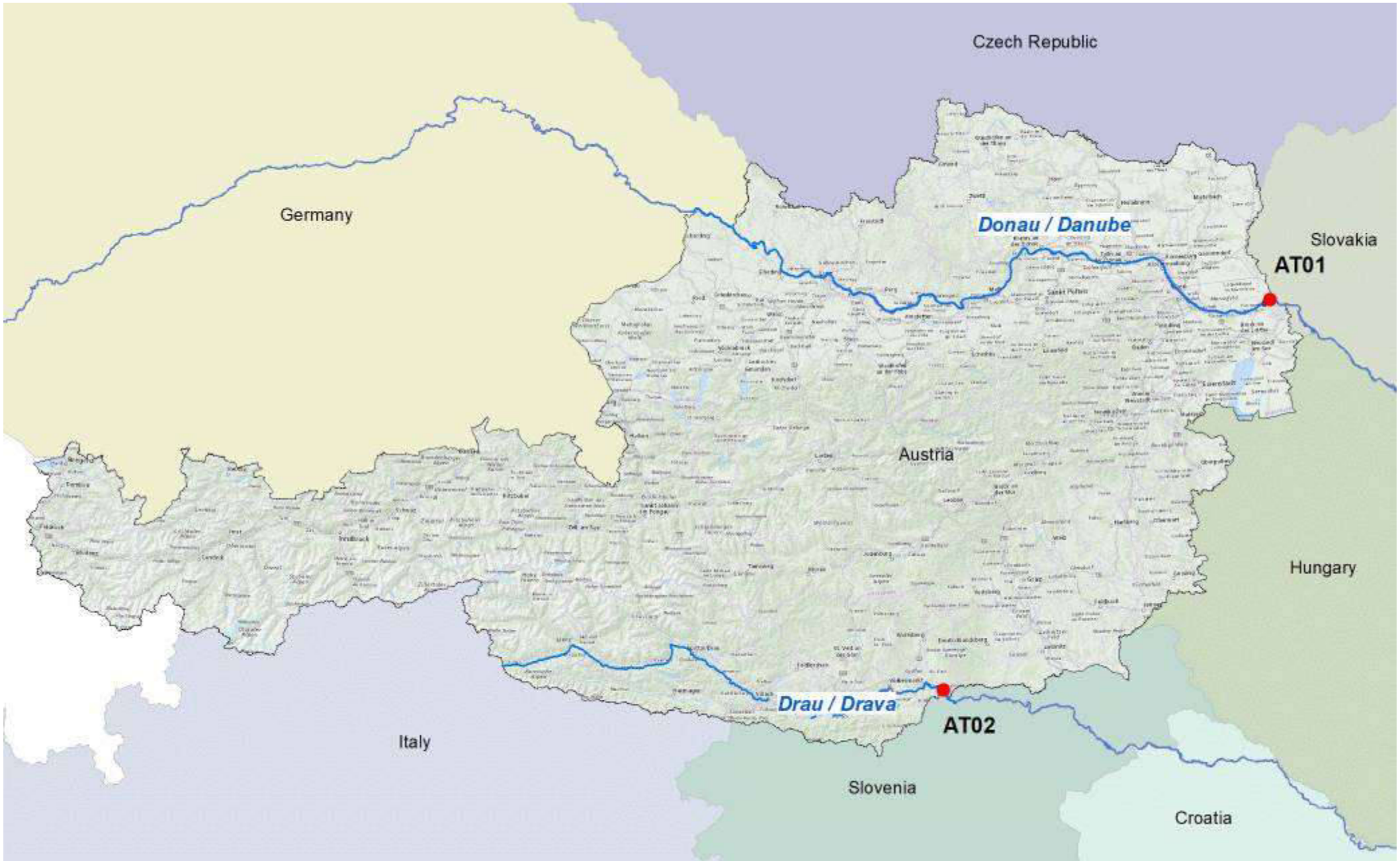
Libor Mikl ✉ libor.mikl@chmi.cz

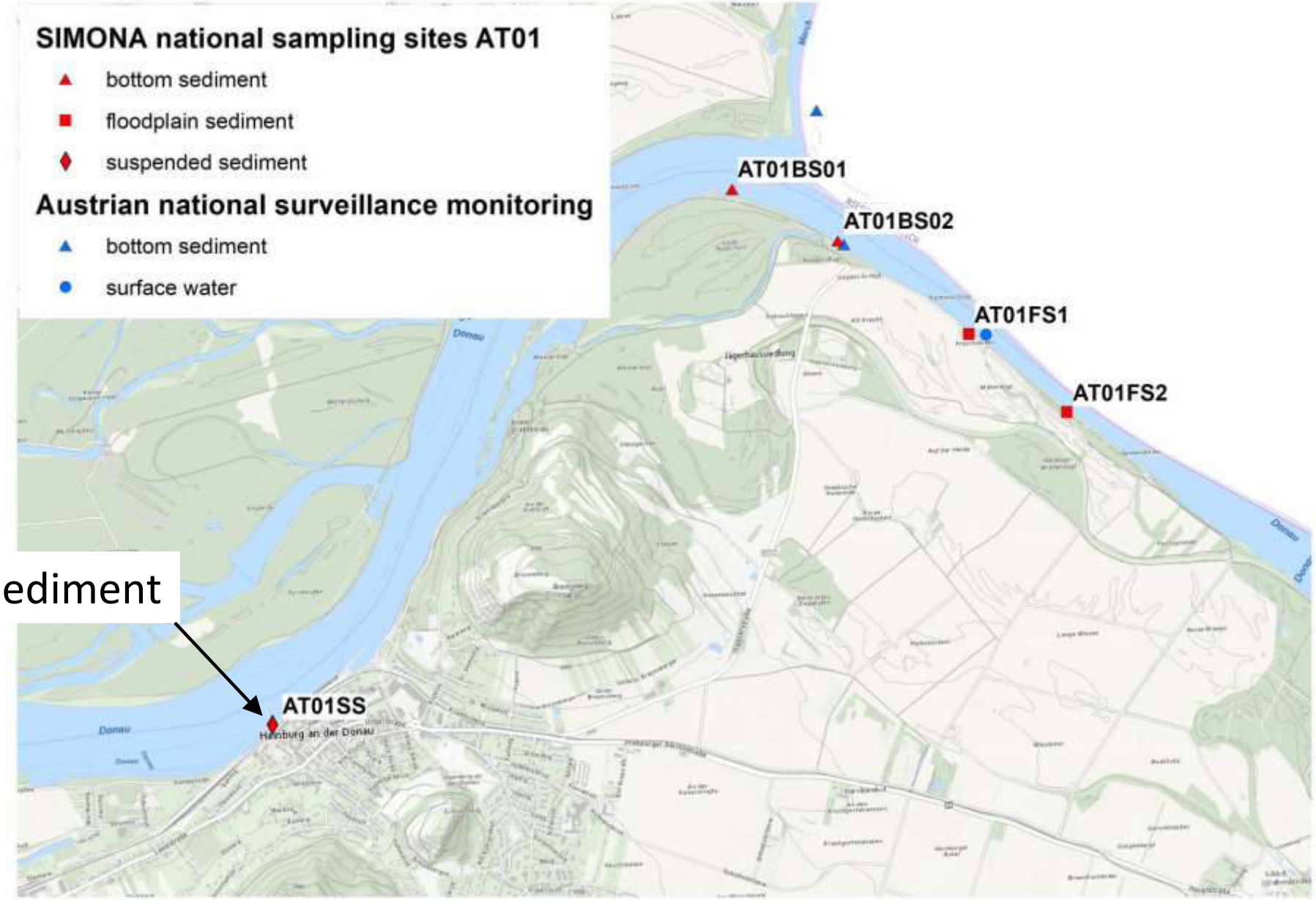
Interreg
Danube Transnational Programme
SIMONA
http://www.interreg-danube.eu/approved-projects/simona

Austrian National Baseline Network Sampling

- Danube at Hainburg - April 14th, 2021
- Drava at Lavamünd - April 26th, 2021

S. Pfleiderer, H. Reitner, B. Träxler — Geological Survey of Austria
F. Humer — Environment Agency Austria
E. Haslinger, P. Kinner, D. Pantelic, R. Friedrich — Austrian Institute of Technology


Czech Republic
Germany
Donau / Danube
Slovakia
AT01
Austria
Hungary
Drau / Drava
AT02
Italy
Slovenia
Croatia



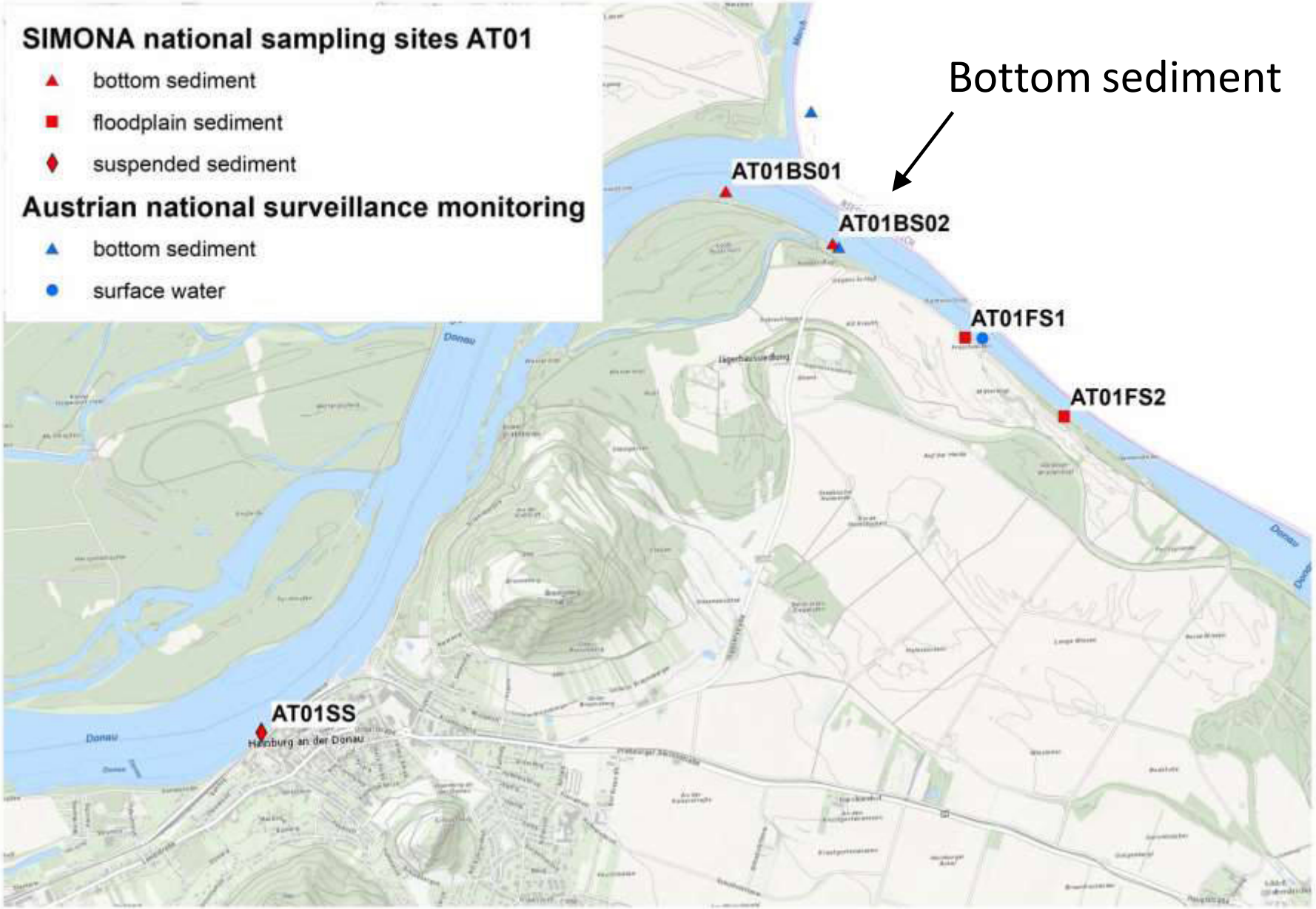
Suspended sediment

Suspended sediment:

- sediment box

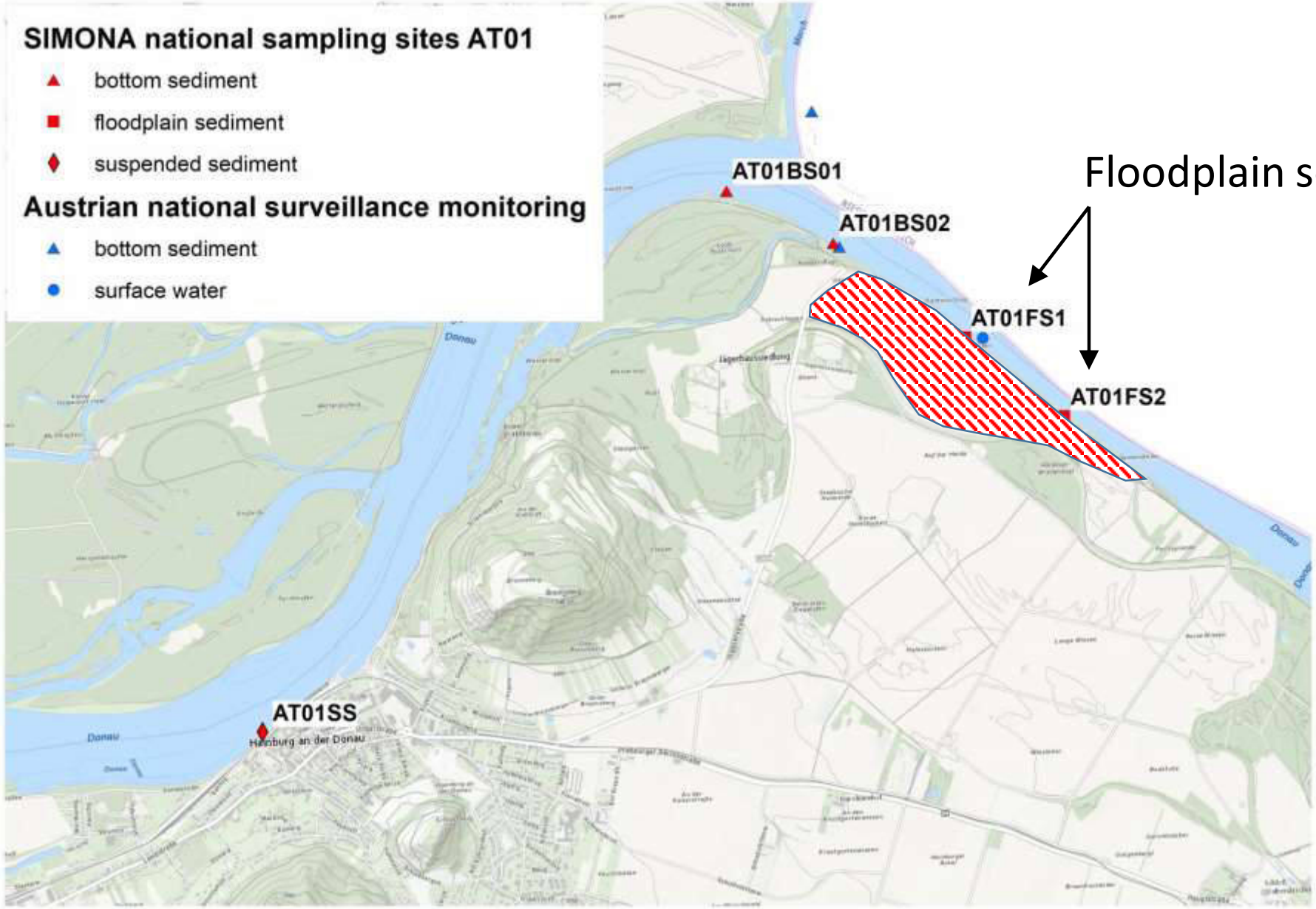
Suspended sediment:

- barrel system


SIMONA national sampling sites AT01
bottom sediment
floodplain sediment
suspended sediment
Austrian national surveillance monitoring
bottom sediment
surface water
Bottom sediment
AT01BS01
AT01BS02
AT01FS1
AT01FS2
AT01SS
Donau

Bottom sediment:

- scoop system


SIMONA national sampling sites AT01
bottom sediment
floodplain sediment
suspended sediment
Austrian national surveillance monitoring
bottom sediment
surface water
AT01BS01
AT01BS02
AT01FS1
AT01FS2
AT01SS
Floodplain sediment

Floodplain sediment

AT01 FS 01

Floodplain sediment:

- spade & knife sy

us, light grey-brown

wn

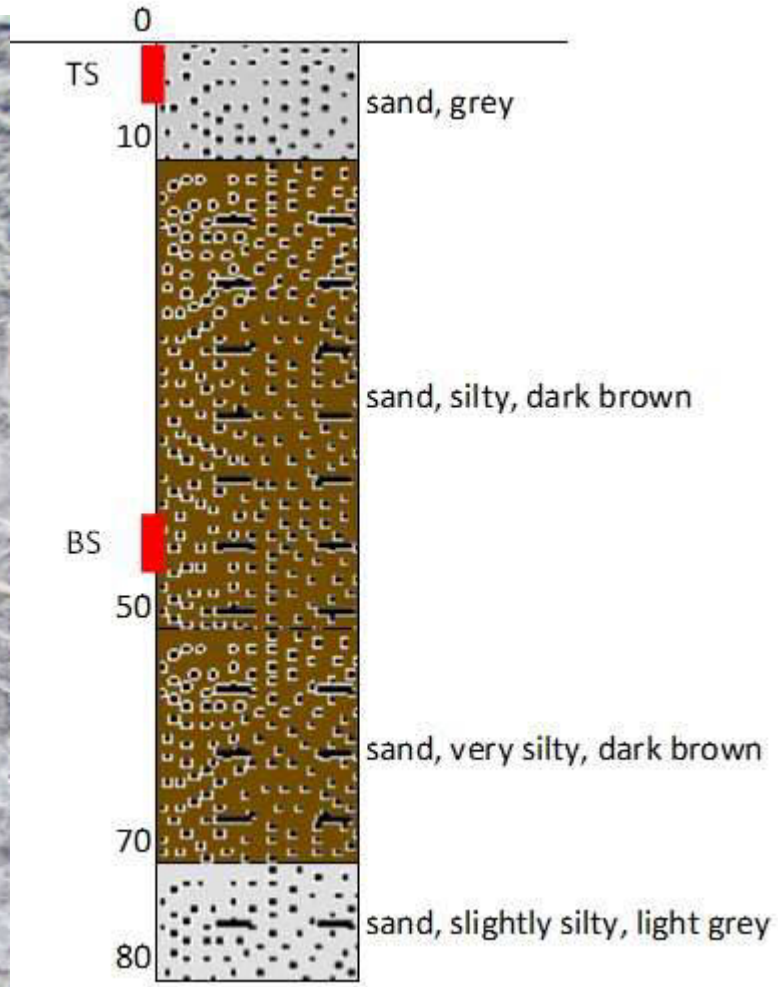
wards the bottom, light grey-brown

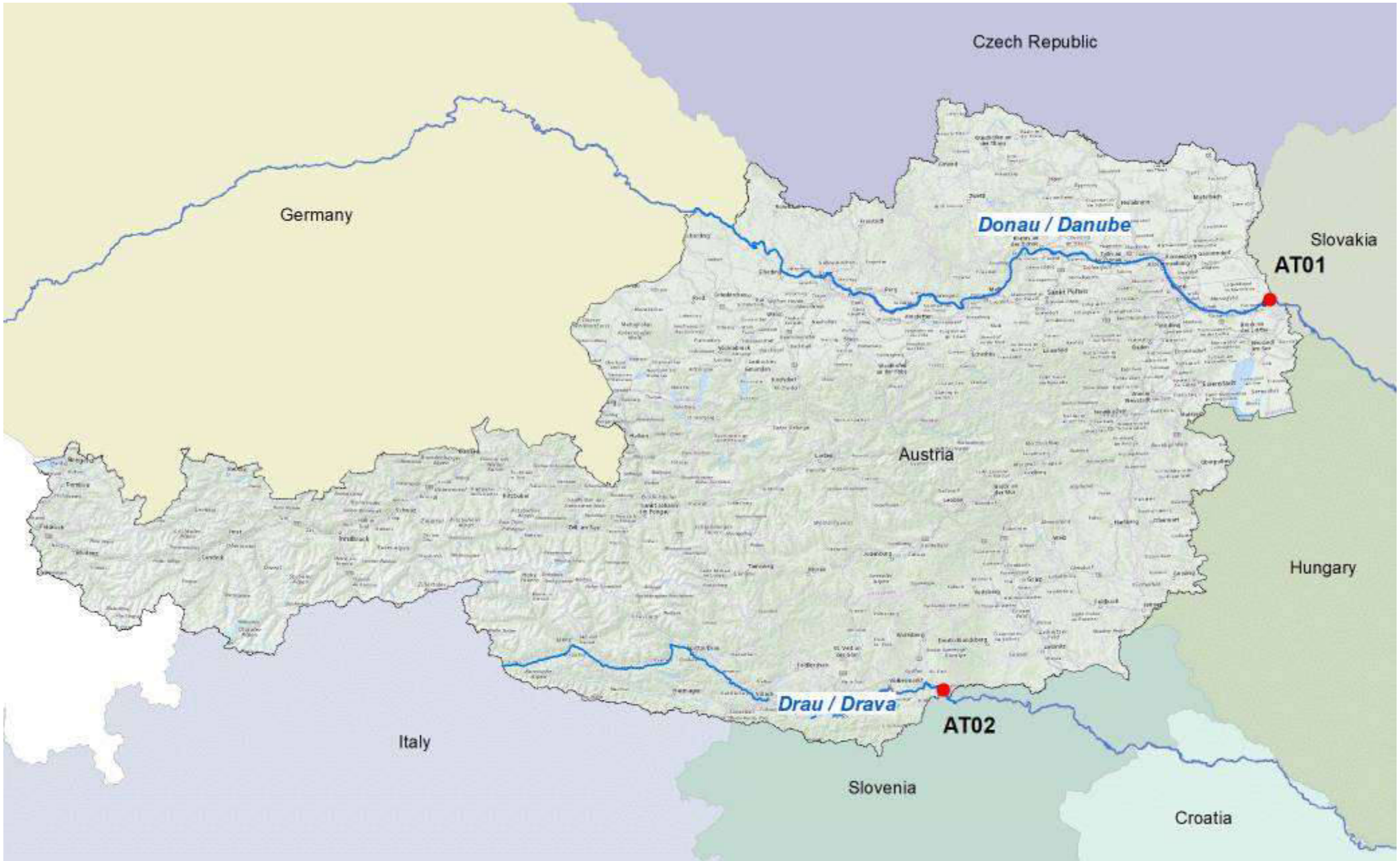
Floodplain sediment

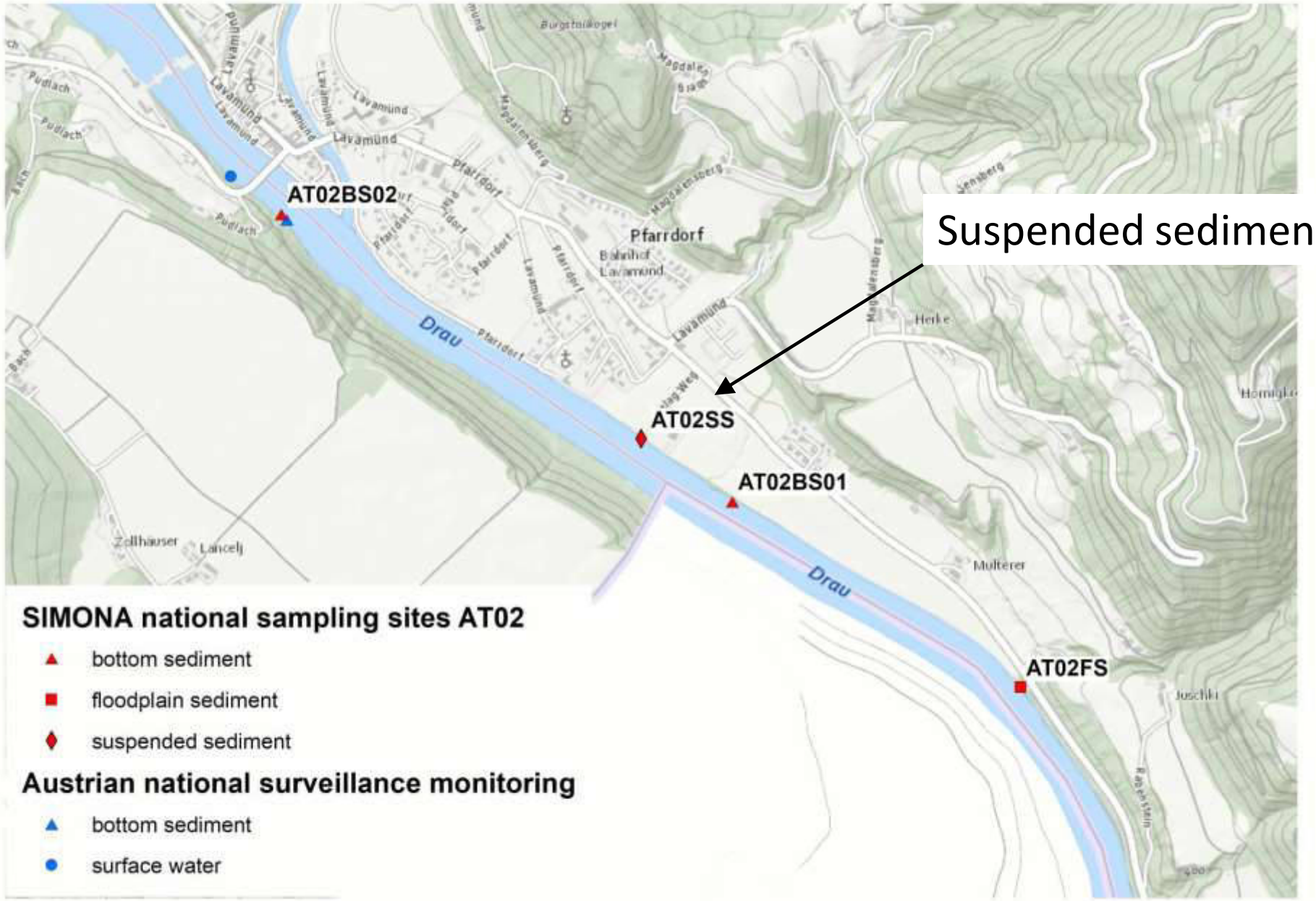
AT01 FS 02

Floodplain sediment:

- spade & knife system



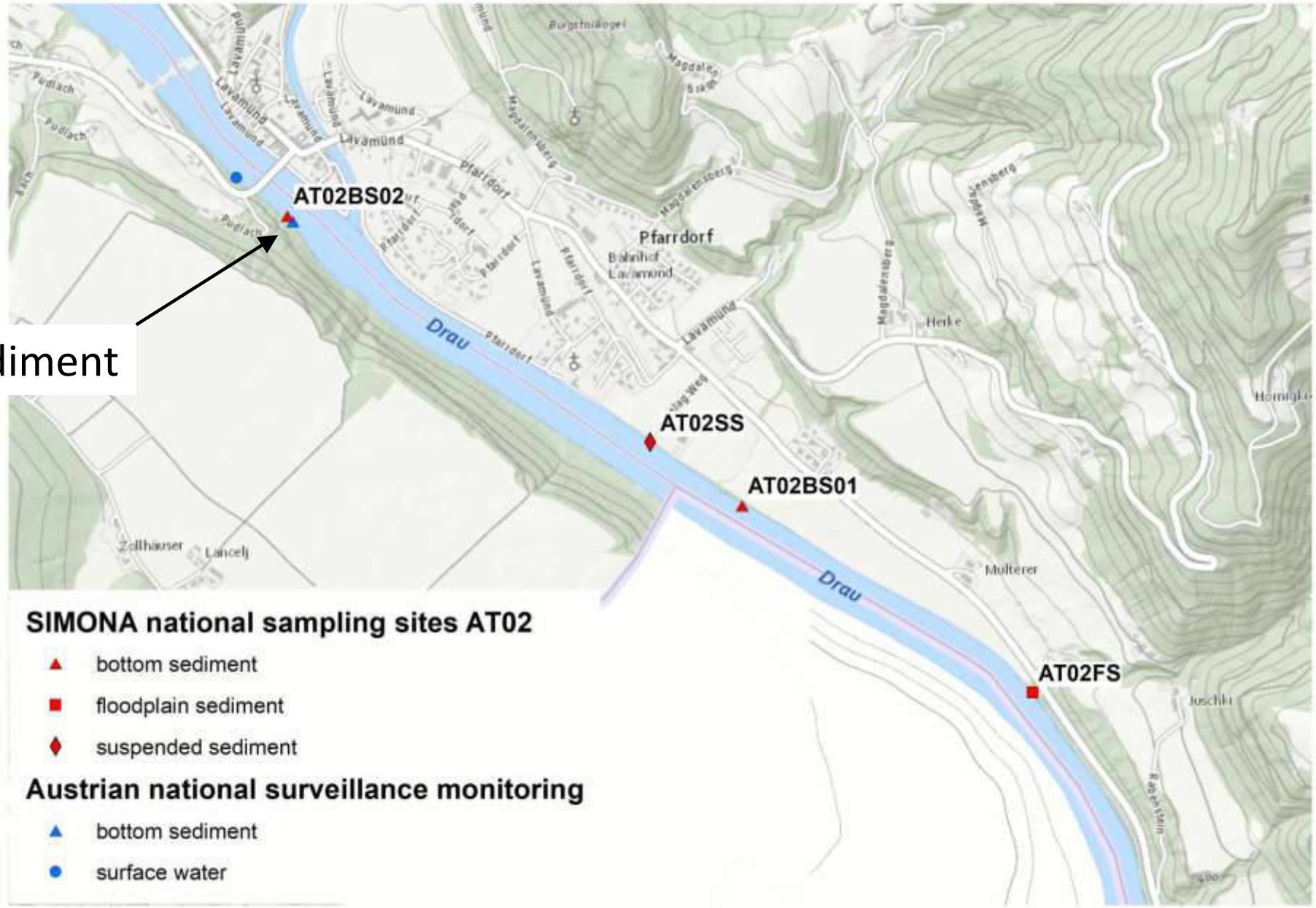

Czech Republic
Germany
Donau / Danube
Slovakia
AT01
Austria
Hungary
Drau / Drava
AT02
Italy
Slovenia
Croatia


Suspended sediment
AT02BS02
AT02SS
AT02BS01
AT02FS
Pfarrdorf
Lavamünd
Drau
Drau
Pudlach
Zellhäuser
Lancelj
Multerer
Herke
SIMONA national sampling sites AT02
bottom sediment
floodplain sediment
suspended sediment
Austrian national surveillance monitoring
bottom sediment
surface water

Suspended sediment:

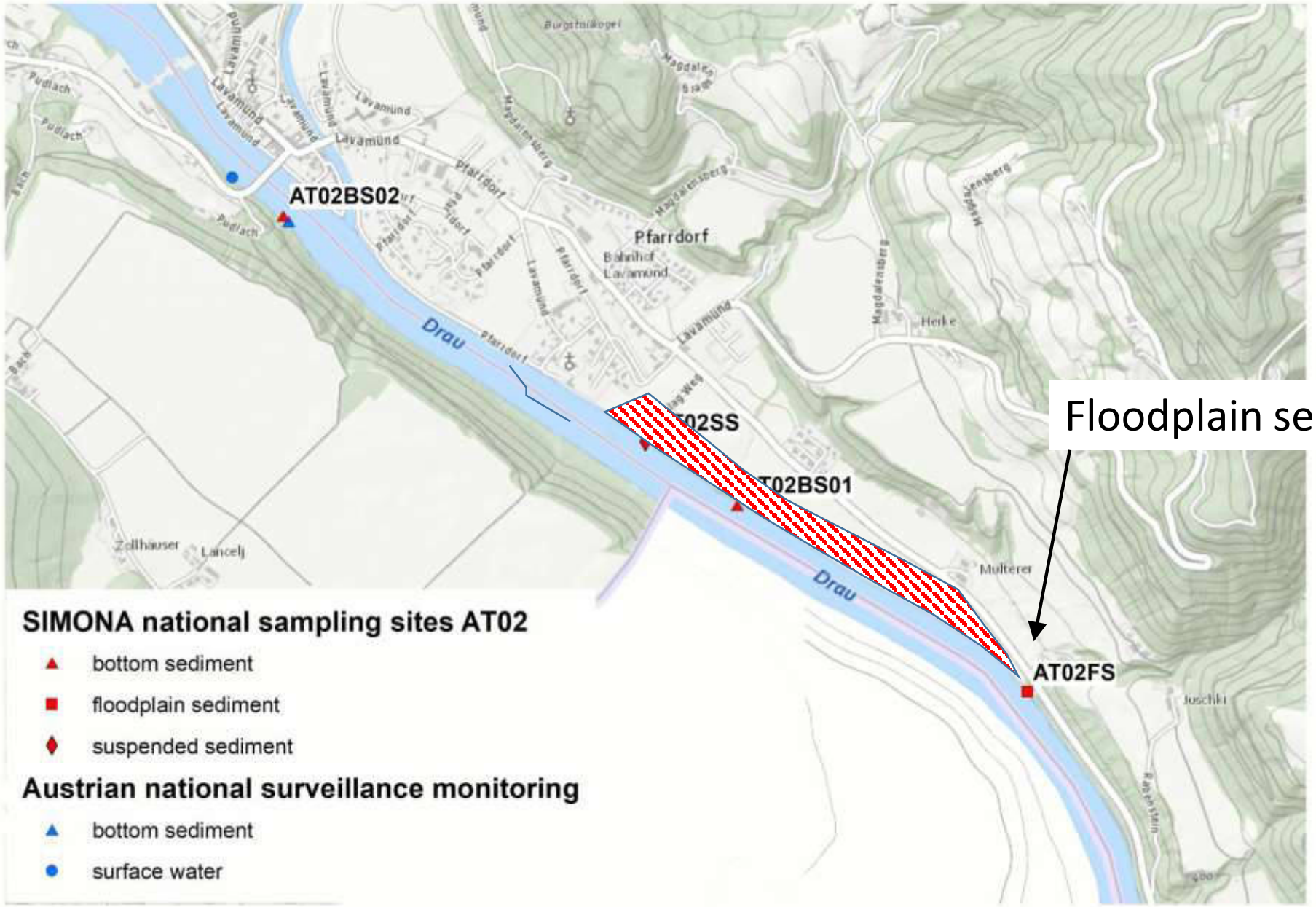
- sediment box

Bottom sediment



Bottom sediment:

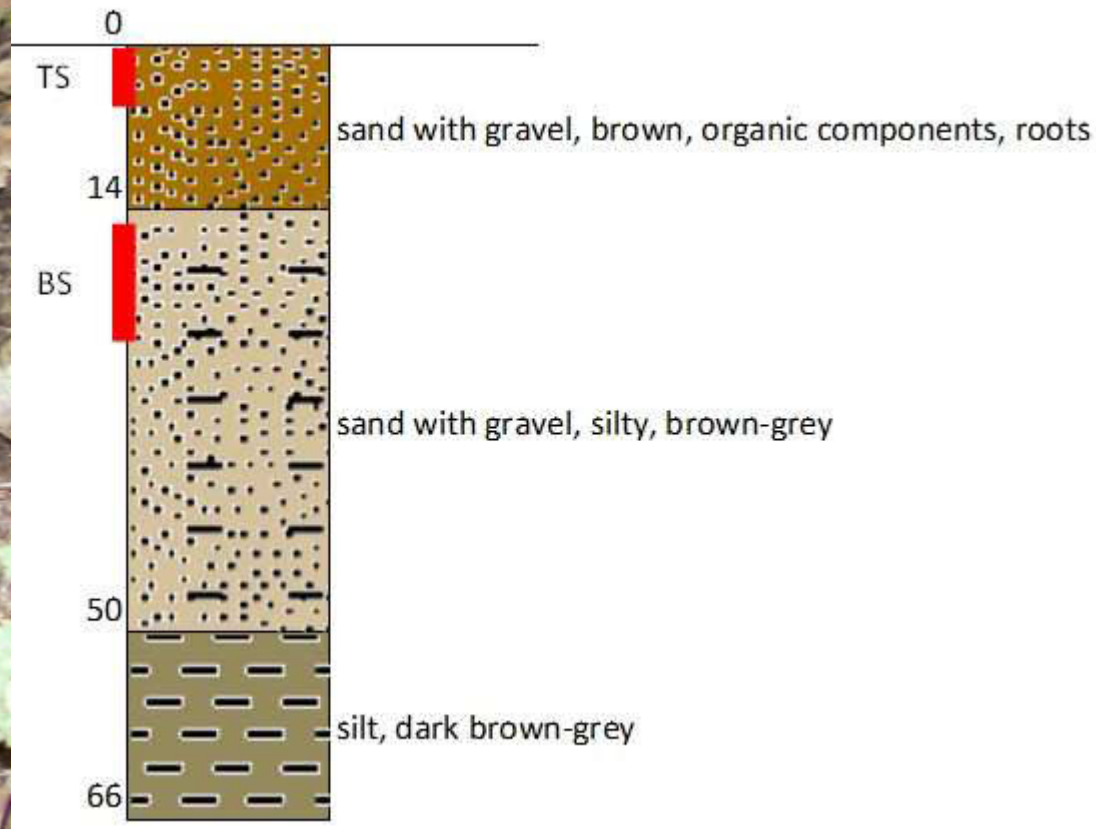
- scoop system


AT02BS02
Pfarrdorf
Drau
T02SS
T02BS01
AT02FS
Floodplain sediment
SIMONA national sampling sites AT02
bottom sediment
floodplain sediment
suspended sediment
Austrian national surveillance monitoring
bottom sediment
surface water

Overbank sediment:

- spade & knife system

AT02 FS 01



Lessons learned:

- **bottom sediment**: existing Austrian national sampling sites not ideal
  - local shore line effects (tributaries, erosion, gravitational slides)
  - no active sediment

- **suspended sediment**:
  - barrel system more flexible in operation but
  - sediment box yields far more sediment

- **floodplain sediment**: ideal sampling site very difficult to find because of
  - agricultural land use
  - flooding prevented by river management (dams, dykes)

The Austrian Team:

- AIT - Austrian Institute of Technology
- UBA - Environment Agency Austria
- GBA - Geological Survey of Austria

2nd SIMONA TRAINING EVENT

Additional value-added activities of SIMONA (WP 8):
Sediment quality evaluation method upgrade and capacity building for uptake

DRAVA Test Area (DTA)

PILOT MONITORING SYSTEM - BARCS

Zsófia Kovács (ASP) & Győző Jordán (Scientific Coordinator)

Project co-funded by the European Union
http://www.interreg-danube.eu/approved-projects/simona

28-29 June 2021

Monitoring site - BARCS

DRAVA RIVER BASIN

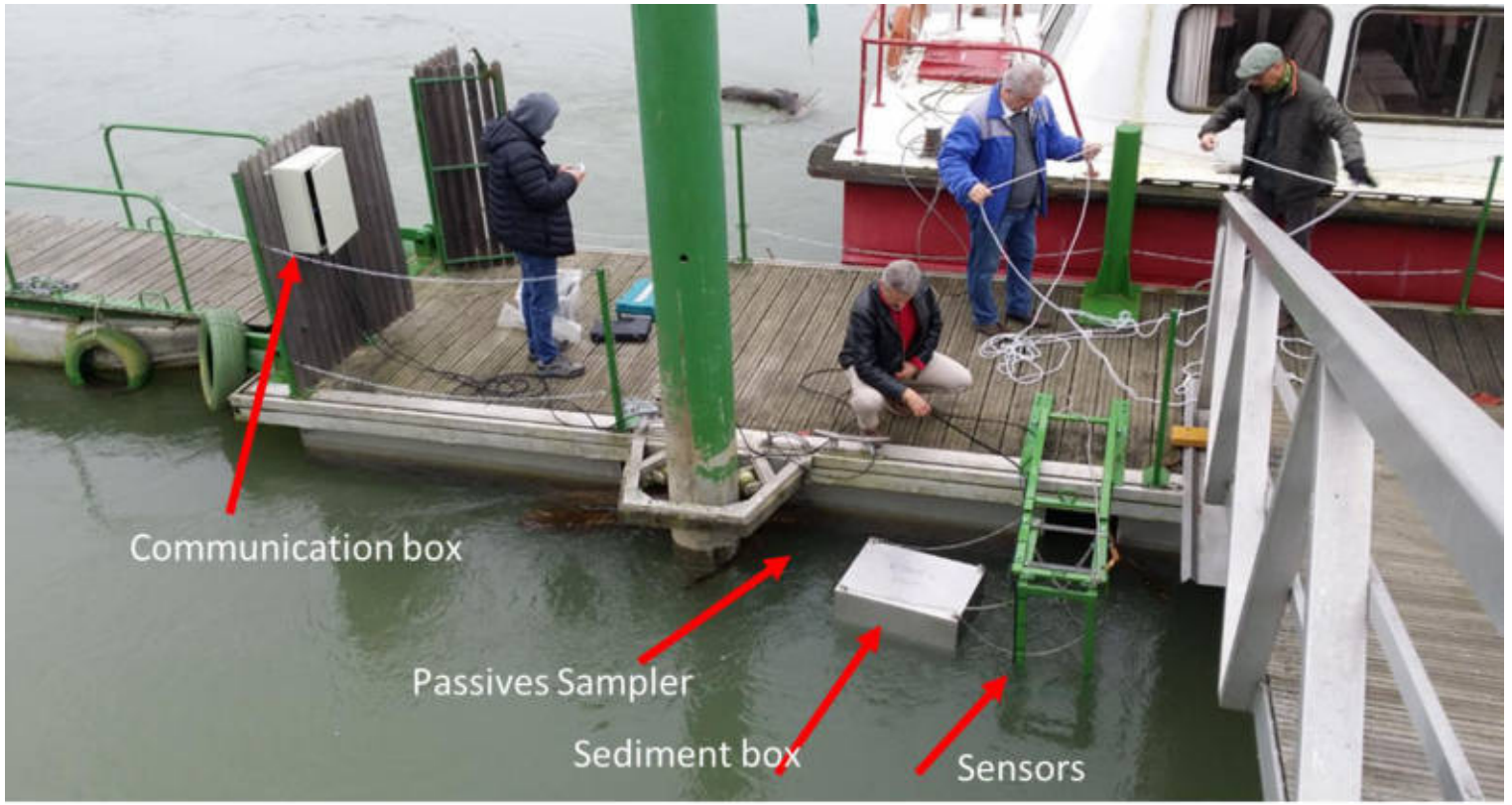
Our goal is to apply an easy-to-use, fast and efficient tool in terms of operation, and from a scientific point of view, the process should be representative and reproducible.

MONITORING SYSTEM - PILOT TEST AREA

Start of the continuous monitoring:
11. November 2020.

Installed types equipment: sediment box (JDS4 Program), flow rate and turbidity sensors (communication box), passive membrane sample container, floodplain sediment box

For sampling of **suspended and floodplain sediment** on the Drava River at Barcs.

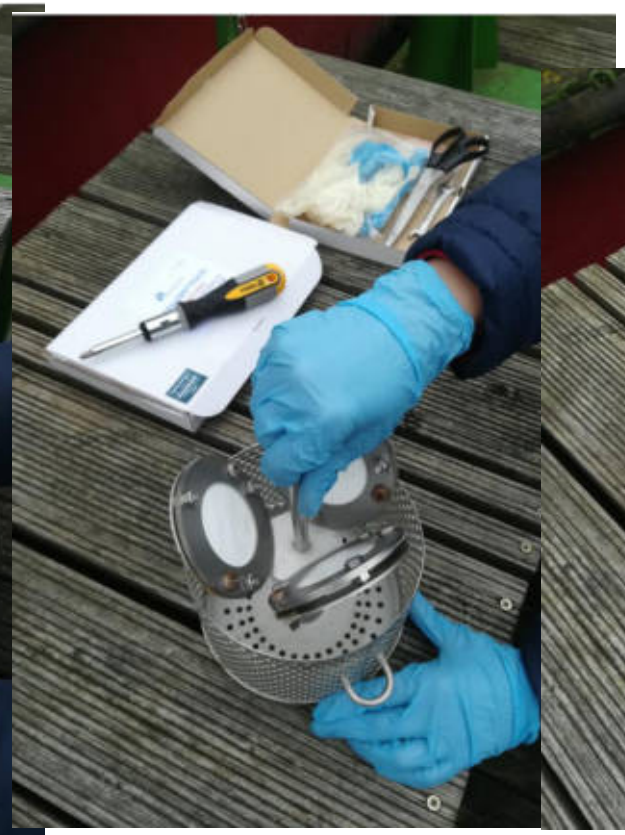


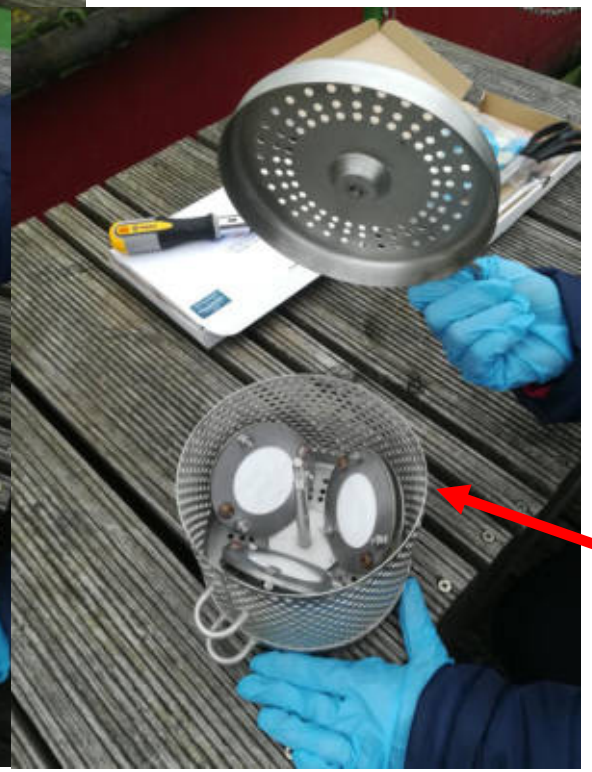
Application of PASSIVE MEMBRANE SAMPLER

(German product)

28.01.2021, Barcs

Beginnings (pilot) - Passive Membrane Sampler + only pesticide membrane





Container (Passive Sampler)

Passive Membrane Sampler (WP8)

1/ We obtained new specific membrane holders to hold the new **powder-free membranes**, and
2/ specific membranes for **Metals, PAHs, and Pesticides**.

Passive Membrane Sampler (WP8)

Support for surveillance monitoring

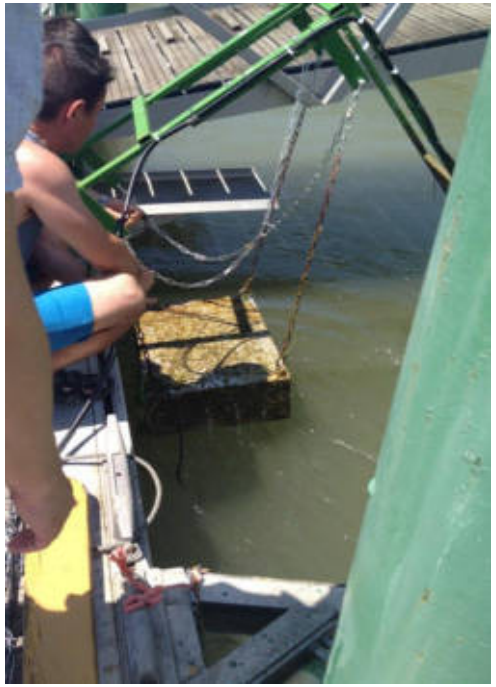
Technical development

- plastic quick release instead of screw
- identification of membranes
- instead of monthly sampling, two weekly sampling (July)

QUANTITATIVE MEASUREMENT – CONTINUOUS WATER FLOW METER

Application of SEDIMENT BOX

Join Danube Survey (JSD4) standard sediment box ((German product)

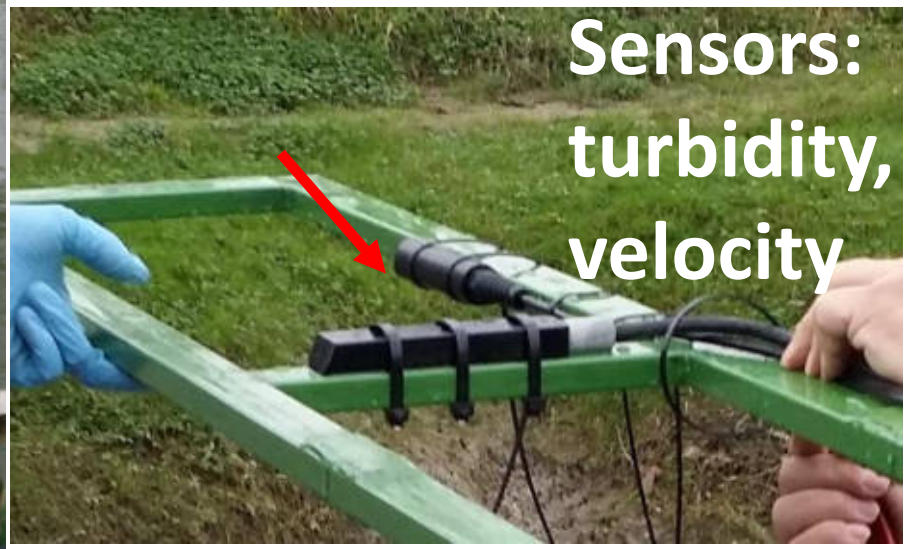


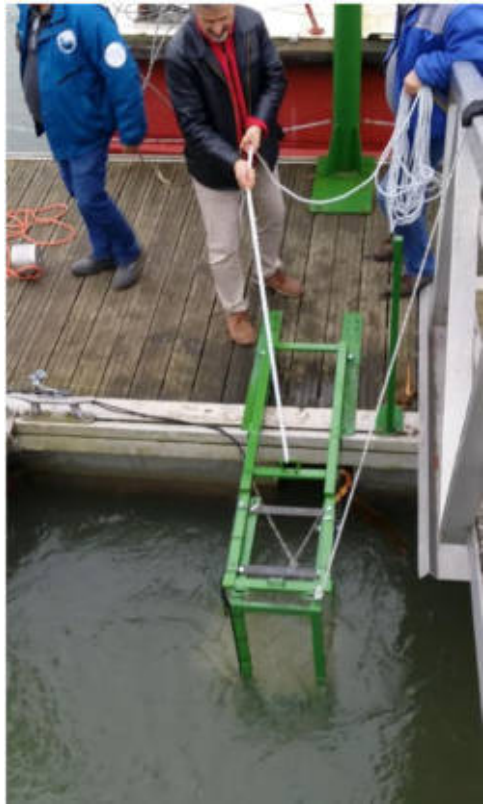
11.11.2020, Barcs,

Sediment Box/Monitoring System

flow rate and turbidity

Sediment box





Operating experience

- 3-hour on-site program
- can not be removed by hand

Process of collecting suspended solids:

1/ water pump

2/remove the settled suspended sediment with a stainless steel spoon

SUPPORT FOR SURVEILLANCE MONITORING

Technical development (WP8)

How can the suspended sediment be quantitatively removed from the box?

1/ we drilled a hole in the bottom of the box

2/fixing the conductivity sensor in the box

3/design – isokinetic form

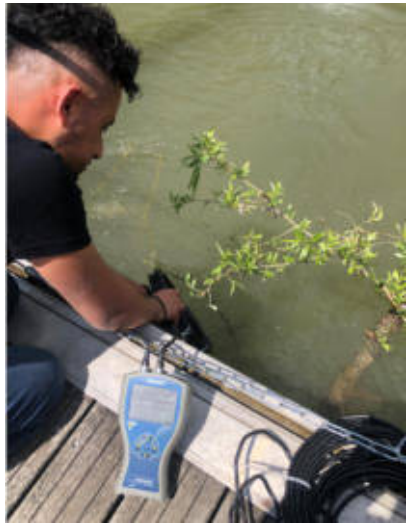
<u>Calibration methodology</u>

- standard suspended sediment sampling (30 L barrel) **/for each sampling**
- The Authority takes a monthly sample of **suspended sediment in the cross-section**

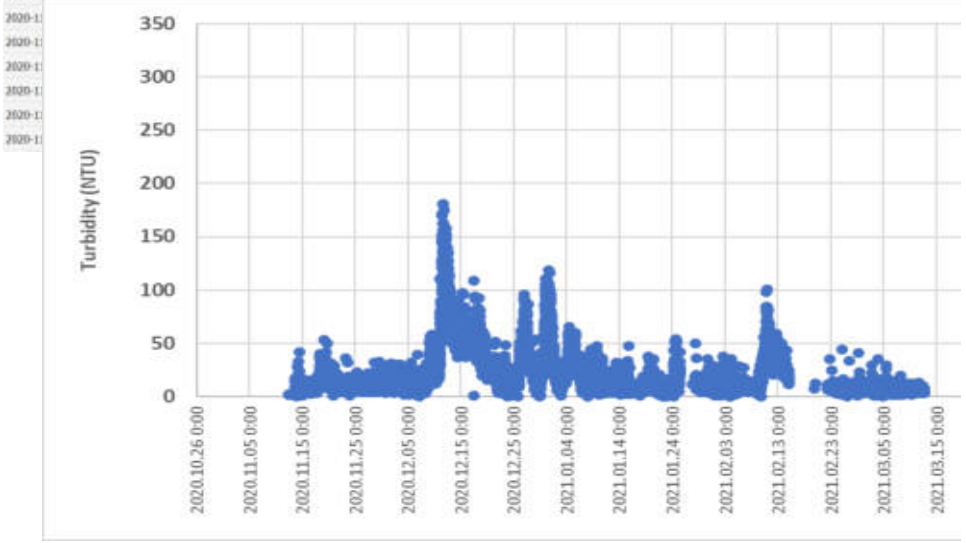
QUANTITATIVE MEASUREMENT – CONTINUOUS WATER FLOW METER AND TURBIDITY

We have also installed turbidity and flow sensors that send measurement results to the website every 15 minutes.

In addition (WP8): pH, DO, conductivity



Mérés ideje	DRAVA DRAVA O_2150_LEVEL_M	DRAVA DRAVA ISCO_2150_TEMP_C	DRAVA DRAVA ISCO_2150_VELOCITY_MS	DRAVA DRAVA ISCO_2150_VOLTAGE_V	DRAVA DRAVA ISCO_2150_VOLUME_M3	DRAVA DRAVA Lebegőanyag tartalom	DRAVA DRAVA Zavarosság
2020-11-14 15:45:00	0.265	8.53	0.393	12.794	169149.062	4.467 mg/l	11.563 NTU
2020-11-14 15:30:00	0.265	8.55	0.477	12.78	169145.25	1.767 mg/l	8.505 NTU
2020-11-14 15:15:00	0.263	8.53	0.43	12.808	169140.766	5.695 mg/l	11.073 NTU
2020-11-14 15:00:00	0.261	8.51	0.402	12.78	169136.156	0.807 mg/l	10.667 NTU
2020-11-14 14:45:00	0.262	8.51	0.376	12.78	169131.891	3.785 mg/l	8.493 NTU
2020-11-14 14:30:00	0.263	8.52	0.447	12.808	169126.922	1.102 mg/l	11.64 NTU
2020-11-14 14:15:00	0.262	8.53	0.457	12.78	169122.719	0.578 mg/l	11.638 NTU
2020-11-14 14:00:00	0.268	8.53	0.527	12.823	169118.078	1.887 mg/l	11.654 NTU
2020-11-14 13:45:00	0.263	8.53	0.436	12.794	169113.75	14.455 mg/l	12.377 NTU



Communication box, accumulator, SIM card

Floodplain Sediment

Floodplain Sediment

- continuously monitored overbank
- event-based deposited suspended sediment

SUMMARY

PILOT Passive Continuously Monitoring System

- Passive membrane sampler (only (pesticide)
- Sediment box (standard- JDS4)
- The passive samplers were supplemented with **continuous flow meters and turbidity sensors**, so we can **perform quantitative analysis**.
- monthly sampling

WP8 Activity, Evaluation upgrade

- Passive membrane sampler (pesticide, PAH, heavy metals)
- New design for the sediment box (hole in the bottom of the box)
- Continuous monitoring with sensors (flow rate, turbidity, **pH, DO, conductivity)**
- two weekly sampling (July)

Thank you for your attention!

PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)