INVENTORY WORKSHOP – TRAINING OF 40 EXPERTS

Output 3.2

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

Programme co-funded by the European Union funds (ERDF, IPA, ENI)

Project duration 1st June 2018 to 1st May 2021, 36 months
Date of preparation 30/04/2019

Compiled by: Anca-Marina Vijdea

Responsible(s) of the deliverable: Anca-Marina Vijdea (RO-IGR)
Co-responsible(s) of the deliverable: Gyozo Jordan (HU-SZIE)

Contents

1. INTRODUCTION

The Inventory workshop was organized by the Geological Survey of Austria, at their headquarters in Vienna, Austria, on 10th April 2019.
42 participants from 12 DTP countries attended the workshop which was an open event to all stakeholders and beneficiaries of the SIMONA project.

The Inventory workshop was organized with the aims of describing the current status of the sediment sampling, laboratory and evaluation protocols of HSs in water, sediment and biota matrixes in project countries from DRB. Also, the international examples of good practices for sampling sediment in large and small rivers were presented. One of the important tasks was also interlinking the SIMONA project with DanubeSediment project by reviewing inventory questions related to sediment quantity dynamics.

This workshop is contributing to building the Specific Objective 'Common knowledge on current status of HSs' sediment monitoring in DRB' (SO1).

2. INVENTORY WORKSHOP AGENDA AND PRESENTATIONS

I. WORKSHOP AGENDA

Wednesday, 10th April (open session for public)

12:00 – 12:30 Registration of participants and welcome coffee

12:30 – 12:35 Welcome by Project Manager (SI-GeoZS) and Host institution AT - GBA
12:35 – 12:50 Scientific Coordinator (HU-SZIE) presentation about status of the SIMONA tasks
12:50 – 13:20 WP3 Leader (RO-IGR) presents the evaluation process of the Inventory Qs.

13:20 – 15:00 Voluntary presentations on available (best) methods

13:20 – 13:40 HU-NARIC/HU-SZIE (Evaluation WG leader presentation; CIS guidance, WFD framework)
13:40 – 14:00 AT-GBA (sampling in small rivers)
14:00 – 14:20 HU-BME (sampling in large rivers)

14:20 – 14:40 Coffee break

14:40 – 15:00 ICPDR presentation (JDS4 plans, available data/support for SIMONA)

15:00 – 16:40 Reviewed the current status by WP4 Activity 4.1.

15:00 – 15:40 Sampling WG leader presentation (status quo + future tasks/problems; CIS guidance, WFD framework)
15:40 – 16:20 Laboratory WG leader presentation (status quo + future tasks/problems; CIS guidance, WFD framework)
16:20 – 17:00 National Authorities – good practices and problems

17:00 – 17:30 Open discussions

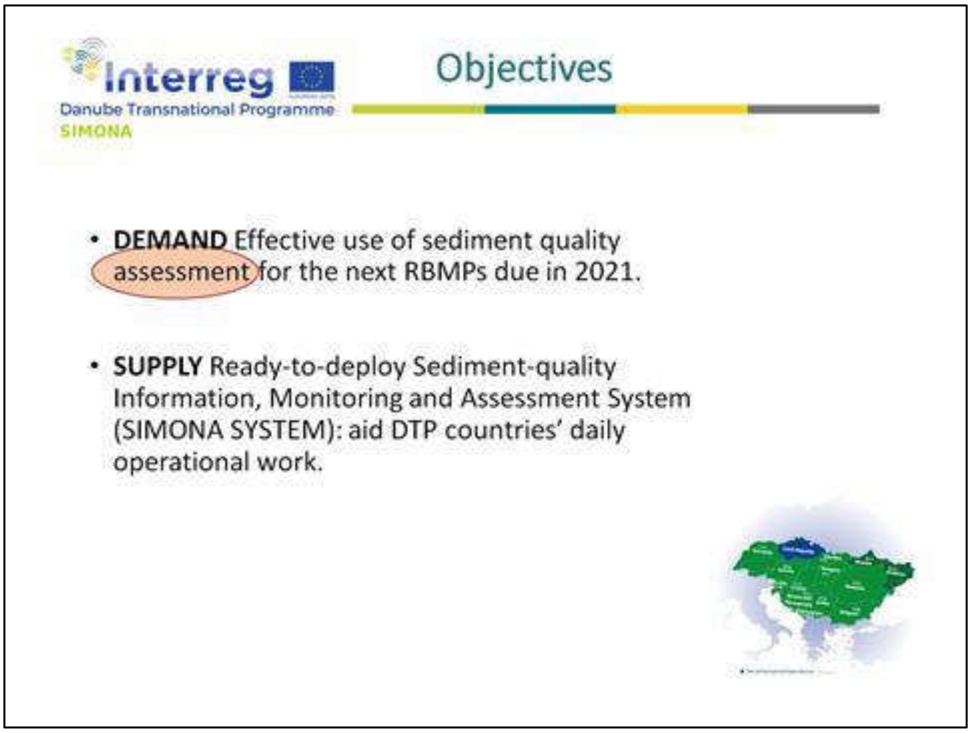
List of participants

No.	Surname	Name	Institution
1	Alexe	Veronica	Geological Institute of Romania
2	Balan	Lidia	Geological Institute of Romania
3	Cerar	Sonja	Geological Survey of Slovenia
4	Čaić Janković	Ana	Croatian Geological Survey
5	Dević	Neda	Geological Survey of Montenegro
6	Erić	Suzana	University of Belgrade – Faculty of Mining and Geology
7	Fodor	Peter	Szent István University
8	Gheorghe	Iepure	Tech.Uni. Of Cluj Napoca, North Uni. Center of Baia Mare
9	Ginin	Stela	Executive Environment Agency
10	Gyuris	Peter	Szent István University
11	Haslinger	Edith	Austrian Institute of Technology GmbH
12	Hiklová	Zuzana	Slovak Water Management Enterprise, state enterprise
13	Hikov	Atanas	Geological Institute of Bulgarian Academy of Sciences
14	Hucko	Pavel	Water research institute
15	Ivanišević	Danijel	Croatian Geological Survey
16	Jordán	Győző	Szent István University
17	Kamenova	Kalinka	Ministry of Environment and Water
18	Kéri	Barbara	Budapest University of Technology and Economics
19	Knoll	Tanja	Geological Survey of Austria
20	Kordik	Jozef	State Geological Institute of Dionyz Stur
21	Kovács	Zsofia	General directorate of water management in Hungary
22	Kovačević	Aleksandra	Public Institution “Waters of Srpska“
23	Liska	Igor	International Commission for the Protection of the Danube River
24	Mišur	Ivan	Croatian Geological Survey
25	Mitrović	Tatjana	Water Institute Jaroslav Černi
26	Mörtl	Mária	National Agricultural Research and Innovation Centre

27	Nasui	Daniel	Tech.Uni. Of Cluj Napoca, North Uni. Center of Baia Mare
28	Nováková	Jarmila	State Geological Institute of Dionyz Stur
29	Pfleiderer	Sebastian	Geological Survey of Austria
30	Roško	Vladimír	Water research institute
31	Simić	Barbara	Geological Survey of Slovenia
32	Stefan	Damian Gheorghe	Technical University of Cluj Napoca, North University Center of Baia Mare
33	Stríček	Igor	State Geological Institute of Dionyz Stur
34	Šarić	Kristina	University of Belgrade – Faculty of Mining and Geology
35	Šorša	Ajka	Croatian Geological Survey
36	Takács	Eszter	National Agricultural Research and Innovation Centre
37	Tokarčíková	Ľudmila	State Geological Institute of Dionyz Stur
38	Vetseva	Milena	Geological Institute of Bulgarian Academy of Science
39	Vićanović	Jelena	Public Institution "Waters of Srpska"
40	Vijdea	Anca-Marina	Geological Institute of Romania
41	Vulić	Dragica	Water Institute Jaroslav Černi
42	Zsolt	Szakacs Laszlo	Technical University of Cluj Napoca, North University Center of Baia Mare

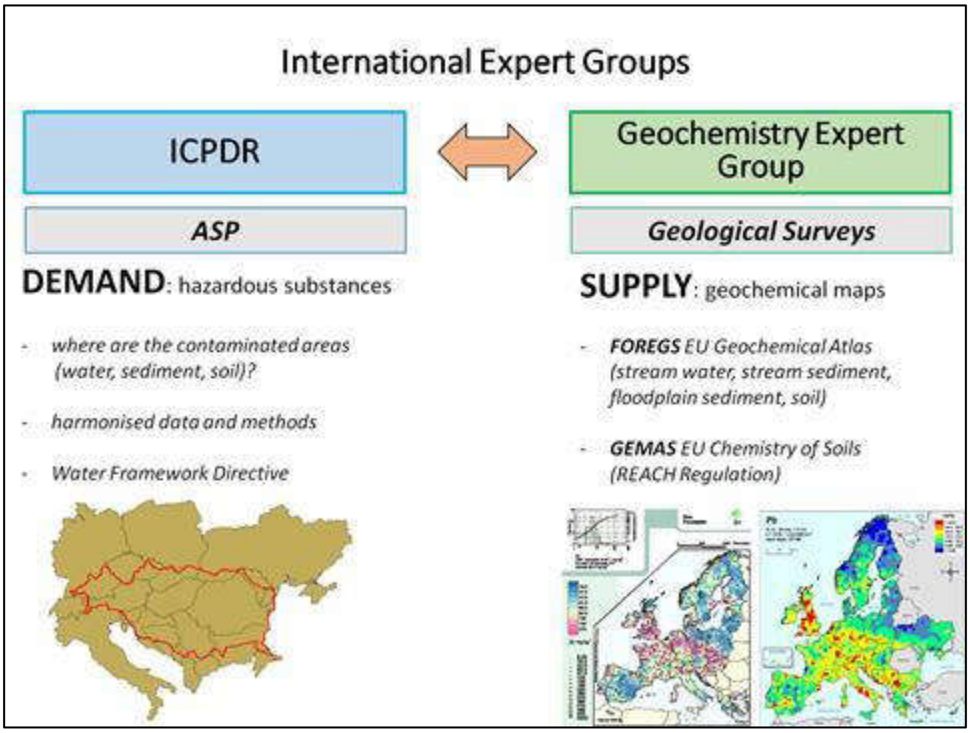
II. PRESENTATIONS

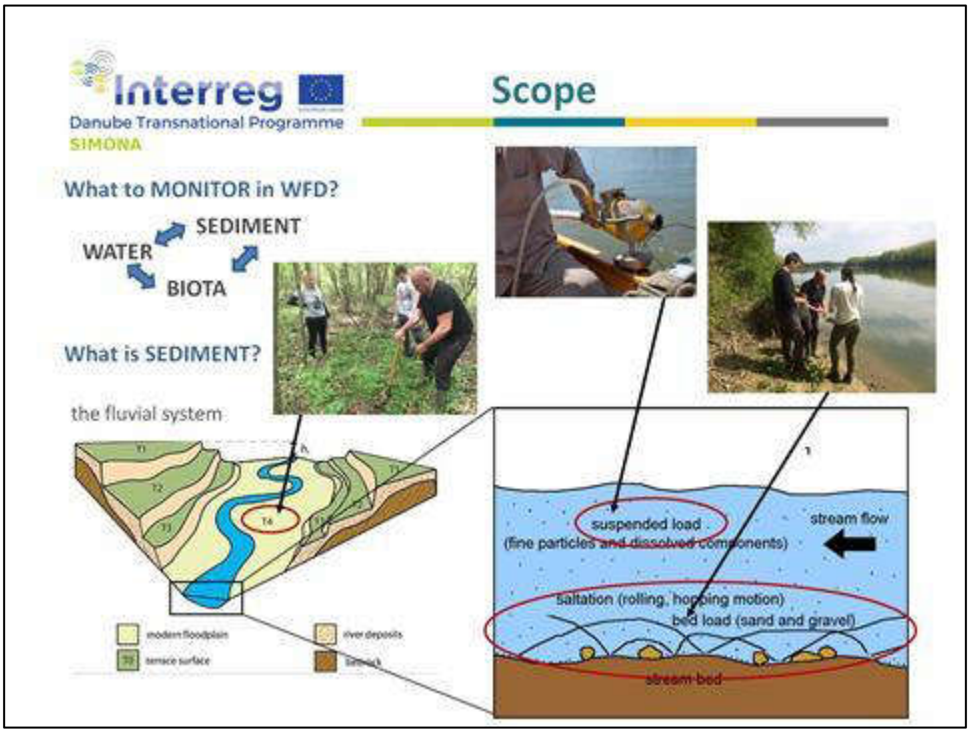
II.1. General presentation of SIMONA project

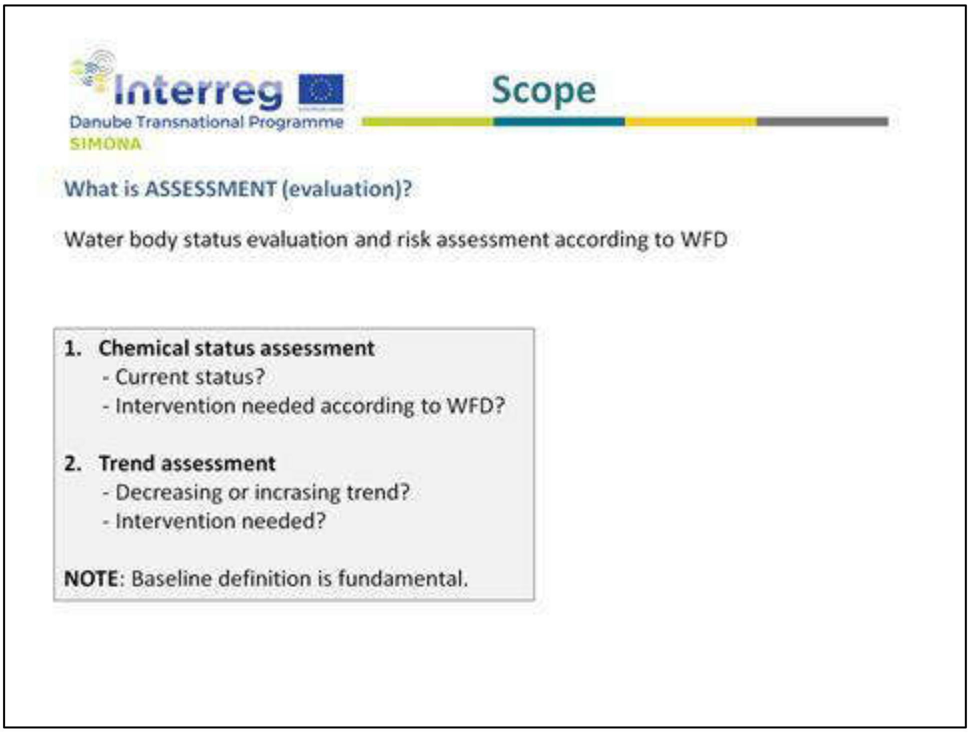


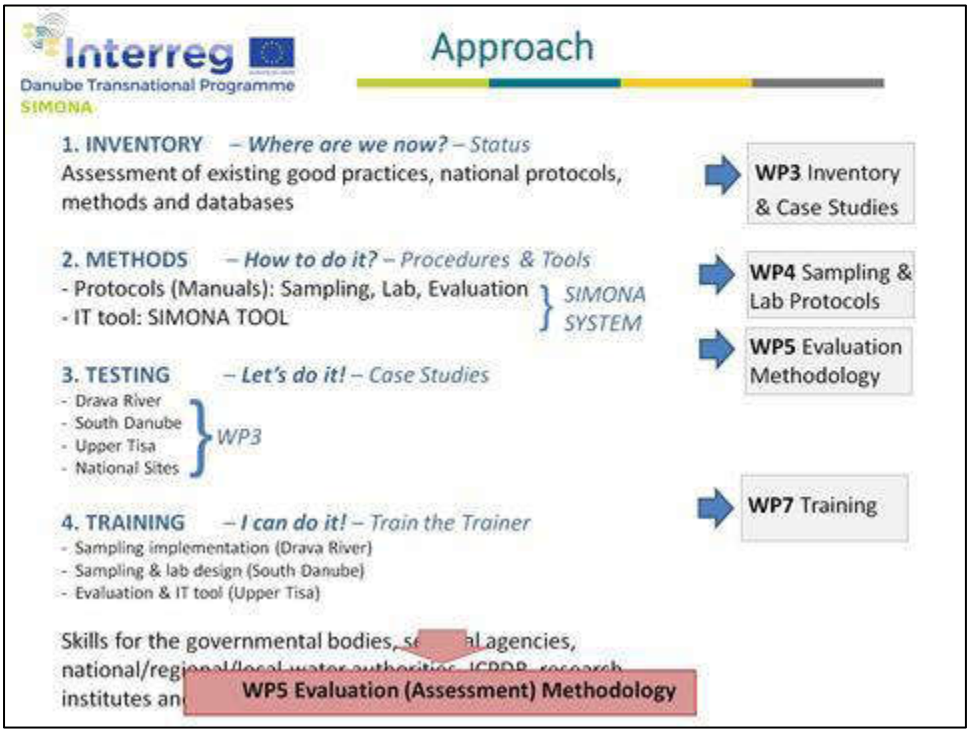

Interreg
Danube Transnational Programme
SIMONA
Objectives
Demand: Sediment Quality Monitoring
• EU legislation (2013/39/EU Directive): sediment quality monitoring and trend analysis of HAZARDOUS SUBSTANCES
• Joint Danube Surveys (JDS 1 and 2): contaminated sediment is an existing problem in the Danube Basin
• Danube Basin Countries do not have enough institutional capacity (information, guidelines and methods) to build transnational sediment monitoring network for Hazardous Substances Trend assessment
• Sediment monitoring is expected to offer cost efficient alternatives to conventional water monitoring for HAZARDOUS SUBSTANCES (WFD CIS Guidance Document No. 25)

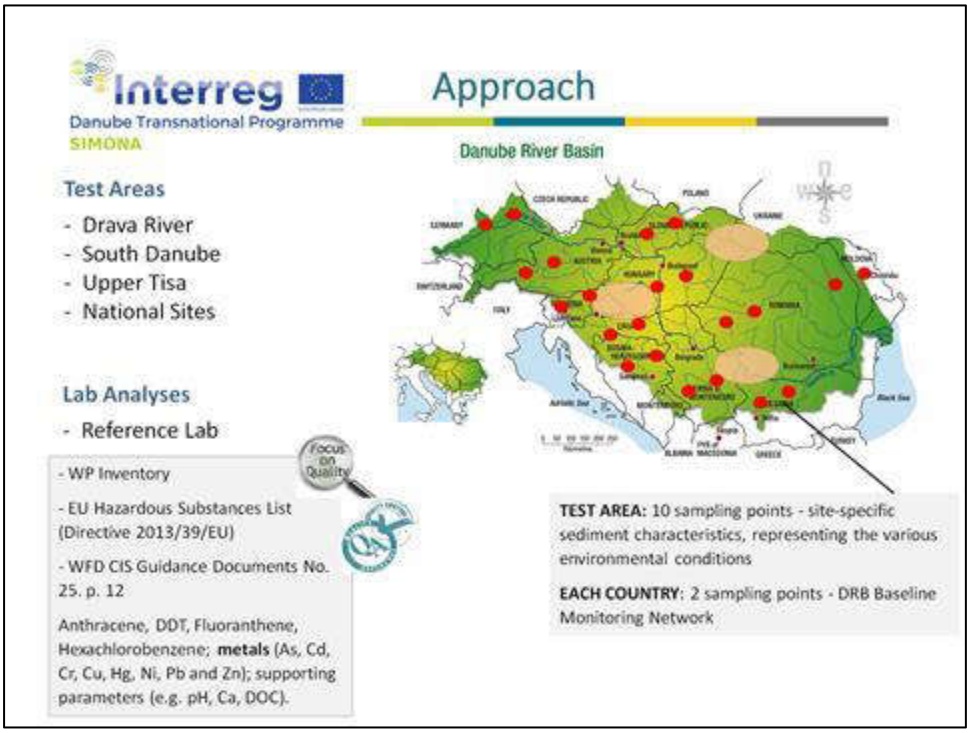

Interreg
Danube Transnational Programme
SIMONA
Mission
icpdr iksd
SIMONA
- Project: Deliver the SIMONA SYSTEM
- Country: Help the daily work of government personnel
- Danube Basin: Help ICDPR – trans-boundary cooperation (DTP)
- EU: Implementation of WFD in Europe for clean waters
- Overall: Create improved living conditions for future generations


International Expert Groups
ICPDR
Geochemistry Expert Group
ASP
Geological Surveys
DEMAND: hazardous substances
- where are the contaminated areas (water, sediment, soil)?
- harmonised data and methods
- Water Framework Directive
SUPPLY: geochemical maps
- FOREGS EU Geochemical Atlas (stream water, stream sediment, floodplain sediment, soil)
- GEMAS EU Chemistry of Soils (REACH Regulation)


Interreg
Danube Transnational Programme
SIMONA
Scope
What to MONITOR in WFD?
SEDIMENT
WATER
BIOTA
What is SEDIMENT?
the fluvial system
suspended load
(fine particles and dissolved components)
stream flow
saltation (rolling, hopping motion)
bed load (sand and gravel)
stream bed

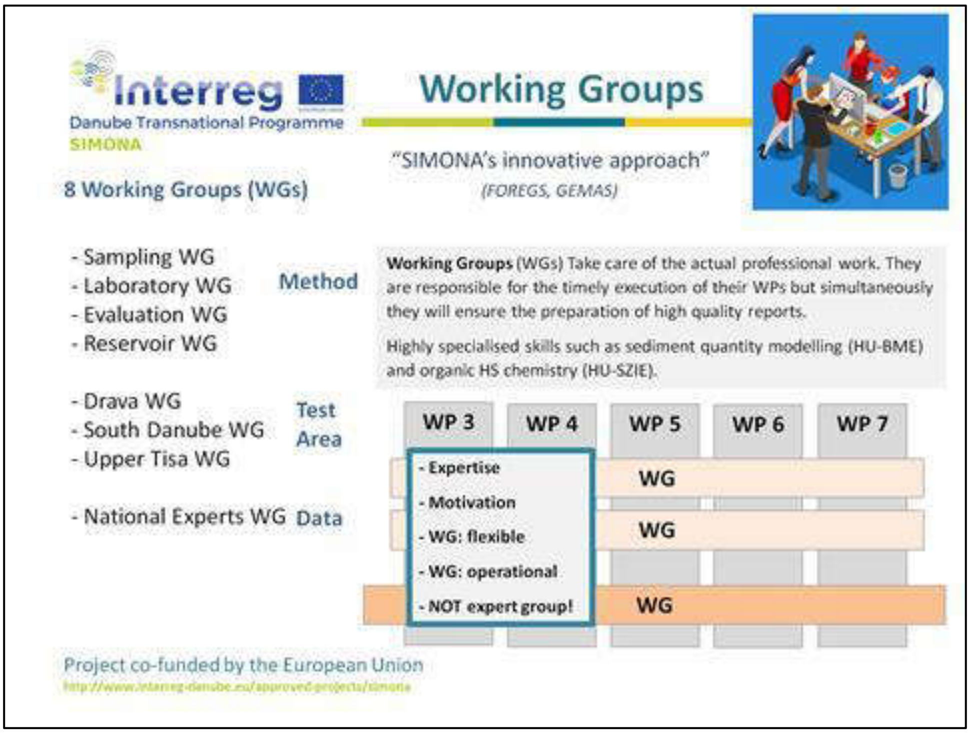

Interreg
Danube Transnational Programme
SIMONA
Scope
What is ASSESSMENT (evaluation)?
Water body status evaluation and risk assessment according to WFD
1. Chemical status assessment
- Current status?
- Intervention needed according to WFD?
2. Trend assessment
- Decreasing or incrasing trend?
- Intervention needed?
NOTE: Baseline definition is fundamental.

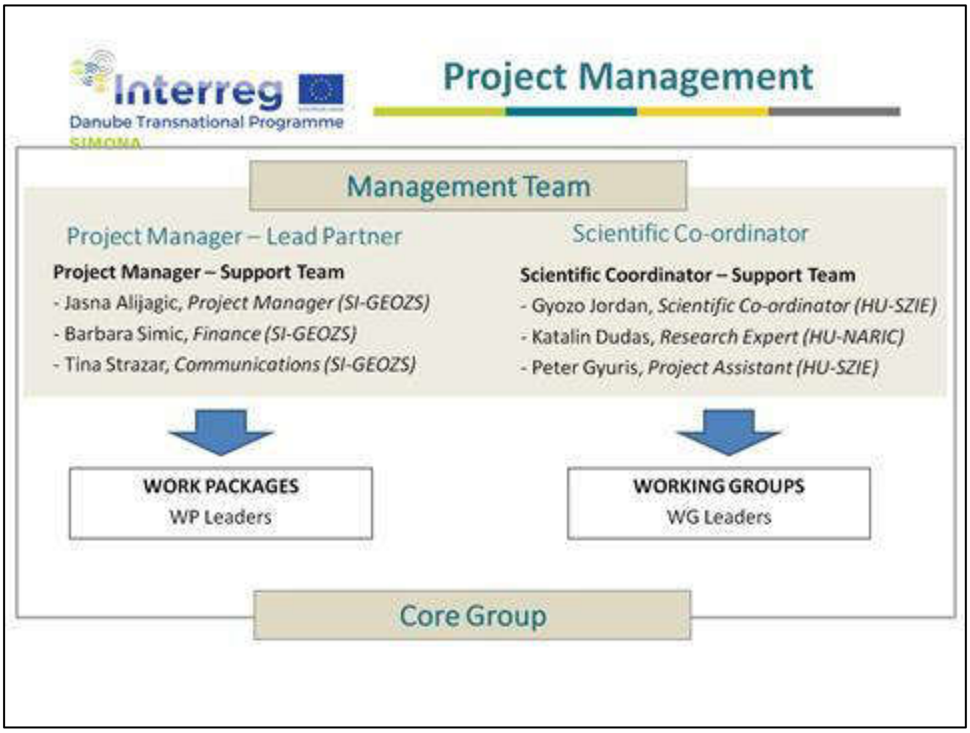

Interreg
Danube Transnational Programme
SIMONA
Approach
1. INVENTORY – Where are we now? – Status
Assessment of existing good practices, national protocols, methods and databases
WP3 Inventory & Case Studies
2. METHODS – How to do it? – Procedures & Tools
- Protocols (Manuals): Sampling, Lab, Evaluation
- IT tool: SIMONA TOOL
SIMONA SYSTEM
WP4 Sampling & Lab Protocols
WP5 Evaluation Methodology
3. TESTING – Let's do it! – Case Studies
- Drava River
- South Danube
- Upper Tisa
- National Sites
WP3
4. TRAINING – I can do it! – Train the Trainer
- Sampling implementation (Drava River)
- Sampling & lab design (South Danube)
- Evaluation & IT tool (Upper Tisa)
WP7 Training
Skills for the governmental bodies,
agencies,
national/regi
institutes an
WP5 Evaluation (Assessment) Methodology

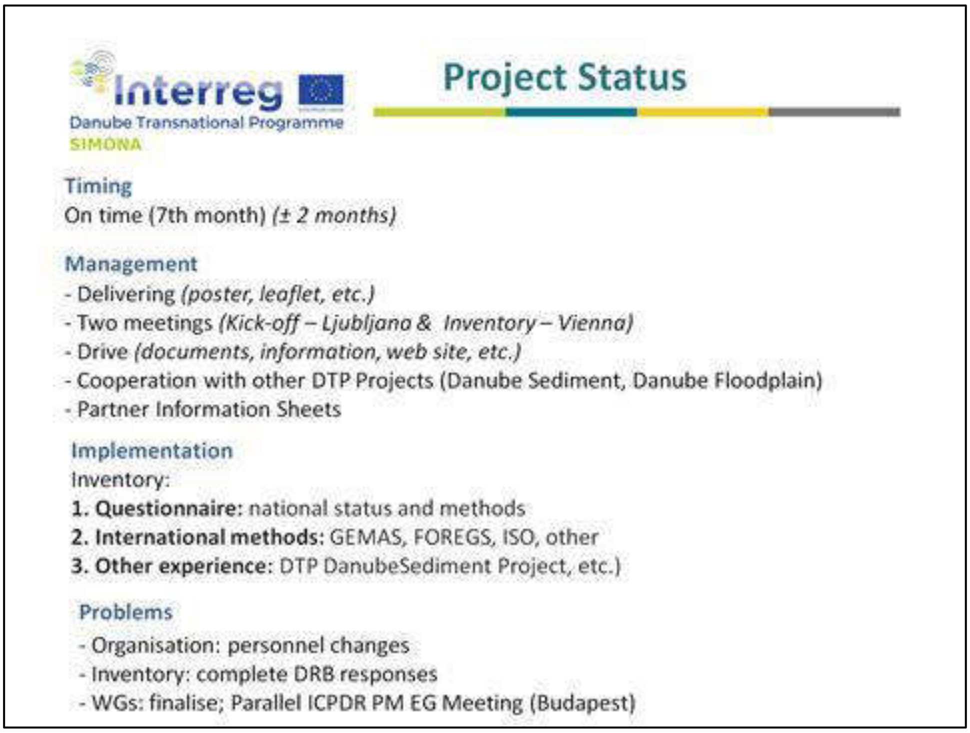

Interreg
Danube Transnational Programme
SIMONA
Approach
Danube River Basin
Test Areas
- Drava River
- South Danube
- Upper Tisa
- National Sites
Lab Analyses
- Reference Lab
- WP Inventory
- EU Hazardous Substances List (Directive 2013/39/EU)
- WFD CIS Guidance Documents No. 25. p. 12
Anthracene, DDT, Fluoranthene, Hexachlorobenzene; metals (As, Cd, Cr, Cu, Hg, Ni, Pb and Zn); supporting parameters (e.g. pH, Ca, DOC).
Focus on Quality
TEST AREA: 10 sampling points - site-specific sediment characteristics, representing the various environmental conditions
EACH COUNTRY: 2 sampling points - DRB Baseline Monitoring Network

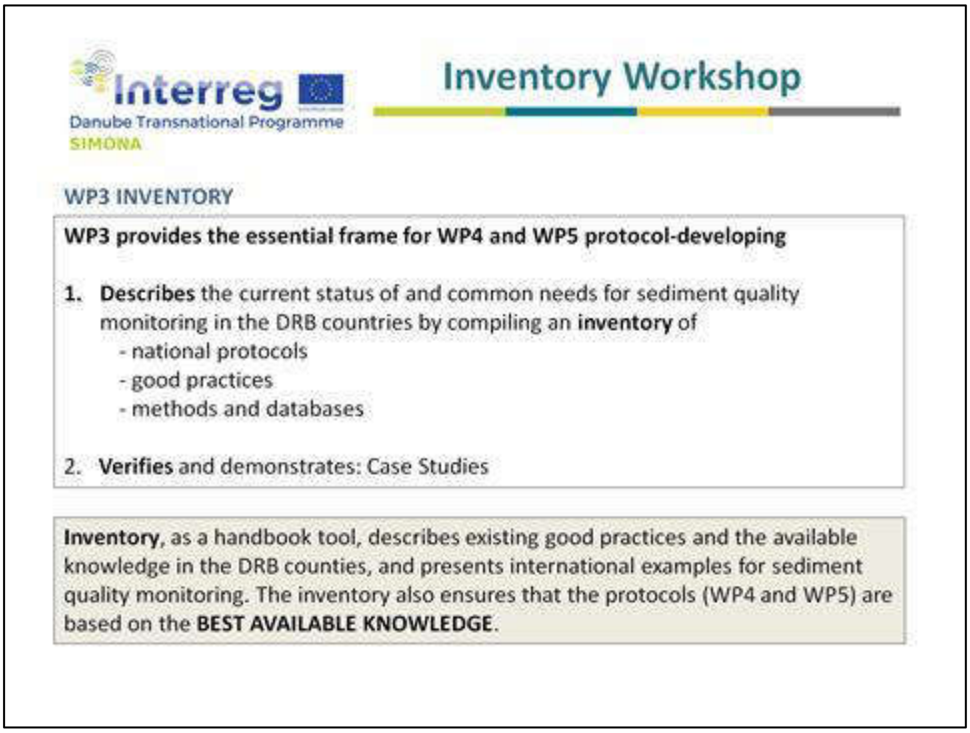

Interreg
Danube Transnational Programme
SIMONA
Approach
GEOCHEMISTRY EXPERT GROUP
Training
- Drava River
- South Danube
- Upper Tisa
- National Sites
Universities


Interreg
Danube Transnational Programme
SIMONA
Implementation
8 Working Groups (WGs)
- Sampling WG
- Laboratory WG
- Evaluation WG
- Reservoir WG
- Drava WG
- South Danube WG
- Upper Tisa WG
- National Experts WG
Project co-funded by the European Union


Interreg
Danube Transnational Programme
SIMONA
Working Groups
"SIMONA's innovative approach"
(FOREGS, GEMAS)
8 Working Groups (WGs)
- Sampling WG
- Laboratory WG
- Evaluation WG
- Reservoir WG
Method
- Drava WG
- South Danube WG
- Upper Tisa WG
Test Area
- National Experts WG
Data
Working Groups (WGs) Take care of the actual professional work. They are responsible for the timely execution of their WPs but simultaneously they will ensure the preparation of high quality reports.
Highly specialised skills such as sediment quantity modelling (HU-BME) and organic HS chemistry (HU-SZIE).
WP 3
WP 4
WP 5
WP 6
WP 7
- Expertise
- Motivation
- WG: flexible
- WG: operational
- NOT expert group!
WG
WG
WG
Project co-funded by the European Union


Interreg
Danube Transnational Programme
SIMONA
Project Management
Management Team
Project Manager – Lead Partner
Project Manager – Support Team
- Jasna Alijagic, Project Manager (SI-GEOZS)
- Barbara Simic, Finance (SI-GEOZS)
- Tina Strazar, Communications (SI-GEOZS)
Scientific Co-ordinator
Scientific Coordinator – Support Team
- Gyozo Jordan, Scientific Co-ordinator (HU-SZIE)
- Katalin Dudas, Research Expert (HU-NARIC)
- Peter Gyuris, Project Assistant (HU-SZIE)
WORK PACKAGES
WP Leaders
WORKING GROUPS
WG Leaders
Core Group


Interreg
Danube Transnational Programme
SIMONA
Project Status
Timing
On time (7th month) (± 2 months)
Management
- Delivering (poster, leaflet, etc.)
- Two meetings (Kick-off – Ljubljana & Inventory – Vienna)
- Drive (documents, information, web site, etc.)
- Cooperation with other DTP Projects (Danube Sediment, Danube Floodplain)
- Partner Information Sheets
Implementation
Inventory:
1. Questionnaire: national status and methods
2. International methods: GEMAS, FOREGS, ISO, other
3. Other experience: DTP DanubeSediment Project, etc.)
Problems
- Organisation: personnel changes
- Inventory: complete DRB responses
- WGs: finalise; Parallel ICPDR PM EG Meeting (Budapest)


Interreg
Danube Transnational Programme
SIMONA
Inventory Workshop
WP3 INVENTORY
WP3 provides the essential frame for WP4 and WP5 protocol-developing
1. Describes the current status of and common needs for sediment quality monitoring in the DRB countries by compiling an inventory of
- national protocols
- good practices
- methods and databases
2. Verifies and demonstrates: Case Studies
Inventory, as a handbook tool, describes existing good practices and the available knowledge in the DRB counties, and presents international examples for sediment quality monitoring. The inventory also ensures that the protocols (WP4 and WP5) are based on the BEST AVAILABLE KNOWLEDGE.


Interreg
Danube Transnational Programme
SIMONA
Inventory Workshop
INVENTORY collects information in the DTP countries:
legislative frameworks
experiences
practices
technical procedures
existing sampling, laboratory and evaluation methods
existing water body monitoring and sampling sites
existing methodologies of surface water chemical status assessment
limit values: national, natural background levels
metadata related to sediment quality monitoring, analysis and assessment
INVENTORY uses:
standardised questionnaire in order to ensure transparency and comparability of information among the countries
Sampling, Laboratory and Evaluation WGs collect the information types for their protocol development, and deliver questions for the questionnaire
National Experts WG collects the questionnaire answers and information from the water authorities


Interreg
Danube Transnational Programme
SIMONA
Inventory Workshop
WP3 INVENTORY
➢ identification of problems of the current monitoring procedures in DRB
➢ review of the sediment monitoring network status, data and metadata availability
➢ inventory of sampling and laboratory methodologies
DELIVERABLE: 'Inventory of DRB sediment monitoring activity'


Interreg
Danube Transnational Programme
SIMONA
Inventory Workshop
WP3 INVENTORY - STATUS
SAMPLING
'Complete' offer for sampling for sediment quality assessment methods on the table:
1. Large River suspended sediment: DTP DanubeSediment Guidance
2. Large River bottom sediment: DTP DanubeSediment Guidance
3. Small River suspended sediment: ???
4. Small River bottom sediment: FOREGS Field Manual
5. Floodplain sediments: FOREGS Field Manual (& Global Geochemical Mapping Manual)
(+6). Other Standards: ISO Sediment Sampling Protocols (2017)
LAB ANALYSIS
ISO Standard procedures


Interreg
Danube Transnational Programme
SIMONA
Inventory Workshop
VIENNA WORKSHOP - TASKS
1. Identify gaps (missing information) in the Questionnaire (WP3 review, country reports), and fill the gaps (follow-up action)
2. Review methods (sampling, lab, evaluation) and experience within the SIMONA Consortium Knowledge Base (GEMAS, FOREGS, DanubeSediment, etc)
3. Review methods in general (ISO, ICPDR, other)
4. Define action plans for the WGs
After Vienna we have to
➢ Assess the Questionnaire information from the WFD viewpoint
➢ Based on the Inventory, WGs/WPs assess and start developing sampling, lab, evaluation methods & protocols


Interreg
Danube Transnational Programme
SIMONA
Opportunity
SIMONA
- Project: Develop future partnership
- Project: Develop cooperation with other DTP projects & network
- Country: Develop research organisation – government links, domestic networks
- EU: Develop future EU projects
- Overall: Carrier development for YOUNG persons, PhD degrees, other
- Overall: Creat a sediment monitoring 'SIMONA' system that is used in the EU, Internationally (FOREGS, GEMAS)

Interreg
Danube Transnational Programme
SIMONA

Working Groups

WGs - Test Area

1. Drava River
2. South Danube
3. Upper Tisa

4. Reservoir

In the 18th month the **Drava, South Danube and Upper Tisa** working groups will

- design sampling points and
- the concrete measuring components (e.g. As(V) as an indicator component for arsenic and its compounds' contamination)

for the 3 test areas, using the already finalised SIMONA 'Transnationally harmonized sampling and laboratory protocols' (delivered in 17th month).

Site selection criteria:

- trans-national character
- existing national, ICPDR monitoring points
- existing supporting background data, information (former, on-going project)
- good access
- Representativity (sediment type, hydrology: small, rage river, etc)
- other

Interreg
Danube Transnational Programme
SIMONA

Working Groups

WGs - Test Area

Drava River WG

Members: AT-GBA, HR-HGI, HU-SZIE, SI-GEOZS

NOTE: In consultation with ASPs: HR-CW-HV and HU-OVF

Upper Tisa WG

Members: HU-SZIE, RO-TUCN, SK-SGID, UA-UGSS

NOTE: In consultation with ASPs: HU-OVF, RO-NARW, SK-WRI-VUVH, SK-SWME and UA-UHMI

South Danube WG

Members: BG-GI-BAS, RO-IGR, RS-UB

NOTE: In consultation with ASPs: RO-NARW and RS-RDV

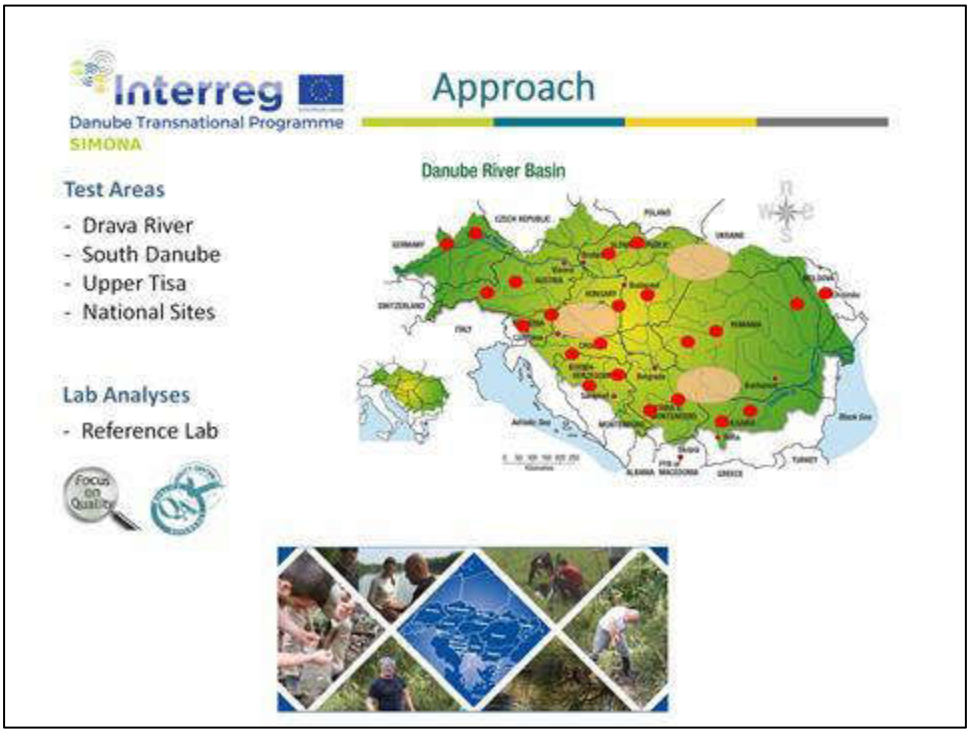
Reservoir WG

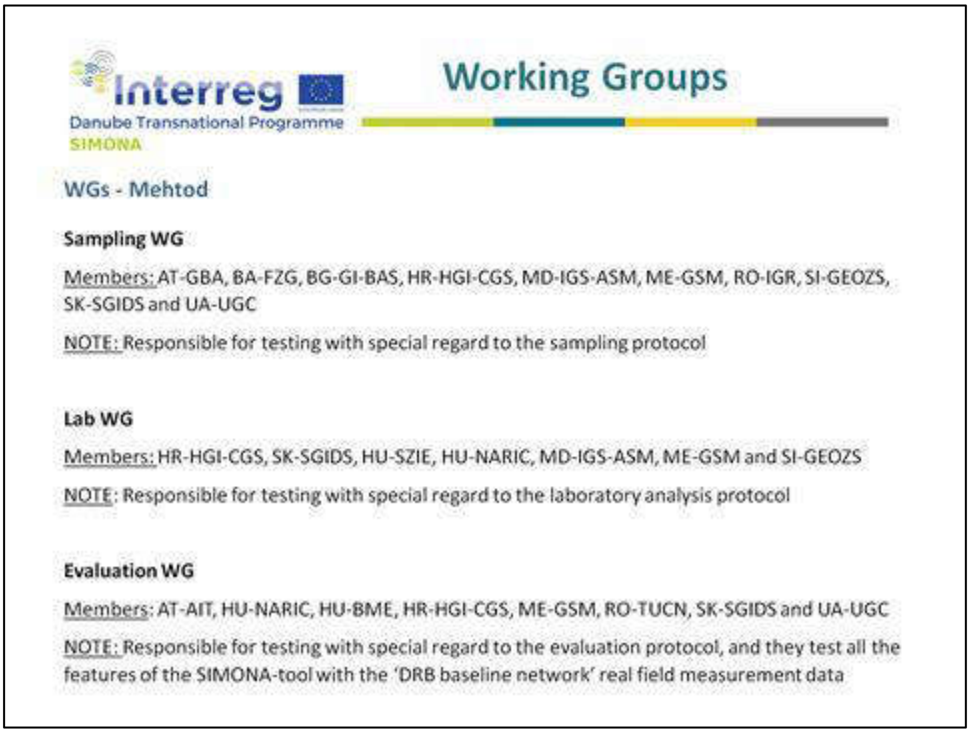
Members: HU-BME, RS-JCI, RS-UB-FMG, SI-GEOZS

NOTE: In consultation with ASPs

Drava, South Danube, Upper Tisa test areas and the Reservoir WGs are responsible for testing with special regard to the field measurement data, and they test all the features of the SIMONA-tool with the test areas real field measurement data.


Interreg
Danube Transnational Programme
SIMONA
Actions
Test Areas
1. Drava River
2. South Danube
3. Upper Tisa
4. National Sites
In the 26th month the members of the National Experts WG will
- design the sampling points (2 points per country) and
- the concrete measuring components
together with national water authorities based on the preceding SIMONA first training event on sampling and laboratory technics at Drava River in the 24th month (WP7).
Site selection criteria:
- serve as the core basis for the development of DRB Sediment Monitoring Network


Interreg
Danube Transnational Programme
SIMONA
Approach
Test Areas
- Drava River
- South Danube
- Upper Tisa
- National Sites
Lab Analyses
- Reference Lab
Danube River Basin


Interreg
Danube Transnational Programme
SIMONA
Working Groups
WGs - Mehtod
Sampling WG
Members: AT-GBA, BA-FZG, BG-GI-BAS, HR-HGI-CGS, MD-IGS-ASM, ME-GSM, RO-IGR, SI-GEOZS, SK-SGIDS and UA-UGC
NOTE: Responsible for testing with special regard to the sampling protocol
Lab WG
Members: HR-HGI-CGS, SK-SGIDS, HU-SZIE, HU-NARIC, MD-IGS-ASM, ME-GSM and SI-GEOZS
NOTE: Responsible for testing with special regard to the laboratory analysis protocol
Evaluation WG
Members: AT-AIT, HU-NARIC, HU-BME, HR-HGI-CGS, ME-GSM, RO-TUCN, SK-SGIDS and UA-UGC
NOTE: Responsible for testing with special regard to the evaluation protocol, and they test all the features of the SIMONA-tool with the 'DRB baseline network' real field measurement data


Interreg
Danube Transnational Programme
SIMONA
Working Groups
WGs - Mehtod
Sampling WG (National Geological Surveys, 2 DTP DanubeSediment partners)
(1) undertakes sampling at the 3 test areas;
(2) contributes to the development of sampling protocol, on the basis of their profound knowledge and experience obtained in the FOREGS and GEMAS projects; and experience in industrial pollution and pesticides measuring;
(3) contributes to demonstration and organisation of exercises on sample collection.
Laboratory WG
(1) manages protocol development, on the basis of their leading knowledge on laboratory analysis and outstanding experience with all kinds of sampling and laboratory work;
(2) contributes to laboratory methods training, according to the developed protocols.
Evaluation WG (research-institutes, SIMONA-tool developing organisation)
(1) develops the evaluation protocol and the SIMONA-tool, on the basis of their experience with environmental risk assessment and developing methodologies;
(2) evaluate the DRB baseline network field data.

Interreg
Danube Transnational Programme
SIMONA

Working Groups

WGs - Method

The Sampling and the Laboratory WG

<u>**EXAMPLE**</u>
critically review the existing water and sediment national methods, the state-of-the-art knowledgebase, good practices and experiences in the DTP countries, including EU and non-EU countries.

Reviewing will be done against the following **criteria**: the developed protocols
(1) should be acceptable in all DTP countries,
(2) should be in-line with the ICPDR and the EU requirements,
(3) use the lattest scientific knowledge, and
(4) have to be sustainable.

The **main steps** of reviewing the sampling and laboratory methods are
(1) reviewing national spatial and temporal sampling and monitoring techniques and laboratory analysis procedures for sediment quality measurements of the water phase, biota, bottom sediment, suspended sediment, floodplain sediment with passive and other sampling technics under the WFD implementation requirements;
(2) reviewing national uncertainty analysis techniques for sampling and laboratory analysis including representativity assessment; and (3) providing a critical summary and conclusions of the reviews.

Interreg
Danube Transnational Programme
SIMONA

Working Groups

WG – National Experts

<u>Members:</u> AT-GBA, BA-FZG, BG-GI-BAS, HR-HGI-CGI, HU-NARIC, MD-IGS-ASM, ME-GSM, RO-IGR, RS-JCI, SI-GEOZS, SK-SGIDS and UA-UGC

National Expert WG will collect the Inventory data, will directly approach the relevant national TGs and discuss the results of the evaluation protocol. With the above mentioned direct outreach for the national TGs and with the 30 days open commenting-period, the Evaluation protocol will be finalized and approved by the TGs, and the protocol will be ready to be integrated into the national and transnational water management methodology and procedures

- WFD Experts

- Contact: TG & ASP

Interreg
Danube Transnational Programme
SIMONA

Actions – scientific part

SIMONA

- **Action 1**: WP Leaders contact WP members: establish network & communication
- **Action 2**: LP: Establish Project File Server (google drive; kick-off ppt's, etc.)
- **Action 3**: WP Leaders send out 'WP Activity Sheets' (what, when, who, how)
- **Action 4**: All project partners receive 'Partner Activity Template' & 'Partner Budget Table'
- **Action 5**: WGs start exchange of information

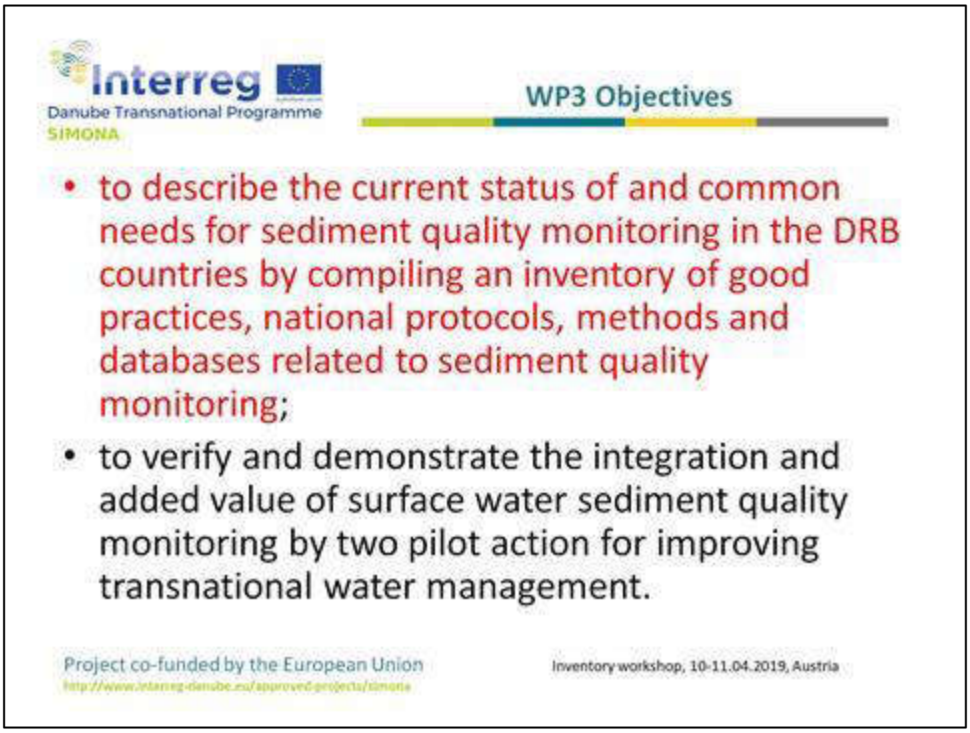
- **Action 6**: INVENTORY
  - design of questionnaire (sampling, lab, evaluation)
  - collecting information from DRB
  - collecting EU, International experience (e.g. UK, Sweden, NL, USA, Canada)

Interreg
Danube Transnational Programme
SIMONA

Working Groups

Drive - WG table:
https://docs.google.com/spreadsheets/d/1Us2HXR5TaEVRQFogWI0OnKSF6So5FXOIHAXadHgBXFA/edit?usp=sharing

II.2. WP3 Inventory report in DRB based on SIMONA countries questionnaires




Interreg
Danube Transnational Programme
SIMONA
INVENTORY QUESTIONNAIRE
5 parts:
I. LEGISLATIVE FRAMEWORK
II. PRACTICES, EXPERIENCES
III. INVENTORY OF SAMPLING METHODOLOGIES
IV. INVENTORY OF LABORATORY METHODOLOGIES
V. INVENTORY OF EVALUATION METHODS
Project co-funded by the European Union
Inventory workshop, 10-11.04.2019, Austria


Interreg
Danube Transnational Programme
SIMONA
I. LEGISLATIVE FRAMEWORK
I.1. National or/and European legislation
I.2. List of hazardous substances in waters, soils, sediments and biota
I.3. Quality objectives for hazardous substances
I.4. Listing of analytical standards
I.5. List of chronic or acute toxicity tests and biota
I.6. List of national and international guides of techniques
I.7. Recommended remedy measures
Project co-funded by the European Union
Inventory workshop, 10-11.04.2019, Austria

Interreg Danube Transnational Programme SIMONA

II. PRACTICES, EXPERIENCES

II.1. Significant projects

II.2. Significant papers

II.3. Sampling sites

II.4. Polluters data availability

II.5. Monitoring problems

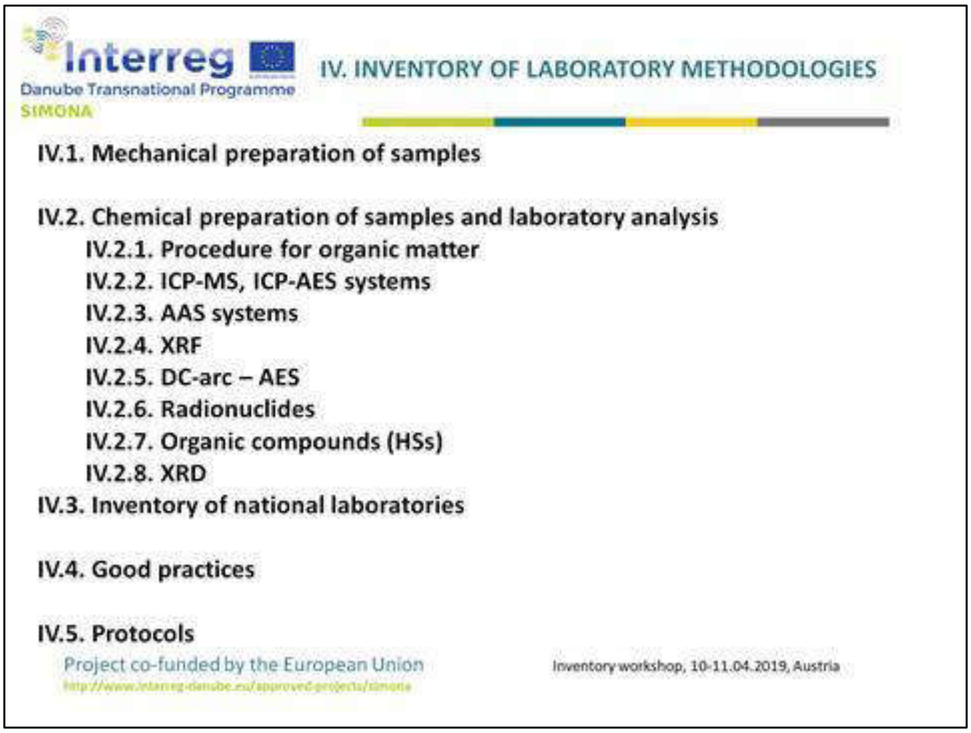
Project co-funded by the European Union
http://www.interreg-danube.eu/approved-projects/simona

Inventory workshop, 10-11.04.2019, Austria

Interreg Danube Transnational Programme SIMONA

III. INVENTORY OF SAMPLING METHODOLOGIES

III.1. Water	III.2. Sediments	III.3. Biota
III.1.1.Design of sampling strategy	III.2.1. Type of sampled/measured sediment	III.3.1. Type of biota
III.1.2.Parameters of water quality/quantity measured in situ	III.2.2. Design of sampling strategy	III.3.2. Design of sampling strategy
III.1.3. Instruments for in situ measurements	III.2.3. Parameters of sediment quality/quantity measured in situ	III.3.3. Parameters of biota quality/quantity measured in situ
III.1.4. Methodology for in situ measurements	III.2.4. Sampling devices for in situ measurements	III.3.4. Instruments for in situ measurements
III.1.5. Tools for collecting samples for laboratory measurements	III.2.5. Methodology for in situ measurements	III.3.5. Methodology for in situ measurements
III.1.6. Sample preservation	III.2.6. Tools for collecting samples for laboratory measurements	III.3.6. Tools for collecting samples for laboratory measurements
III.1.7. Methodology for sample collecting	III.2.7. Methodology of sample collecting for laboratory measurements	III.3.7. Methodology of sample collecting for laboratory measurements
	III.2.8. Transport methodology of samples for laboratory measurements	III.3.8. Transport methodology of samples for laboratory measurements
	III.2.9. Sample archiving	III.3.9.Sample archiving

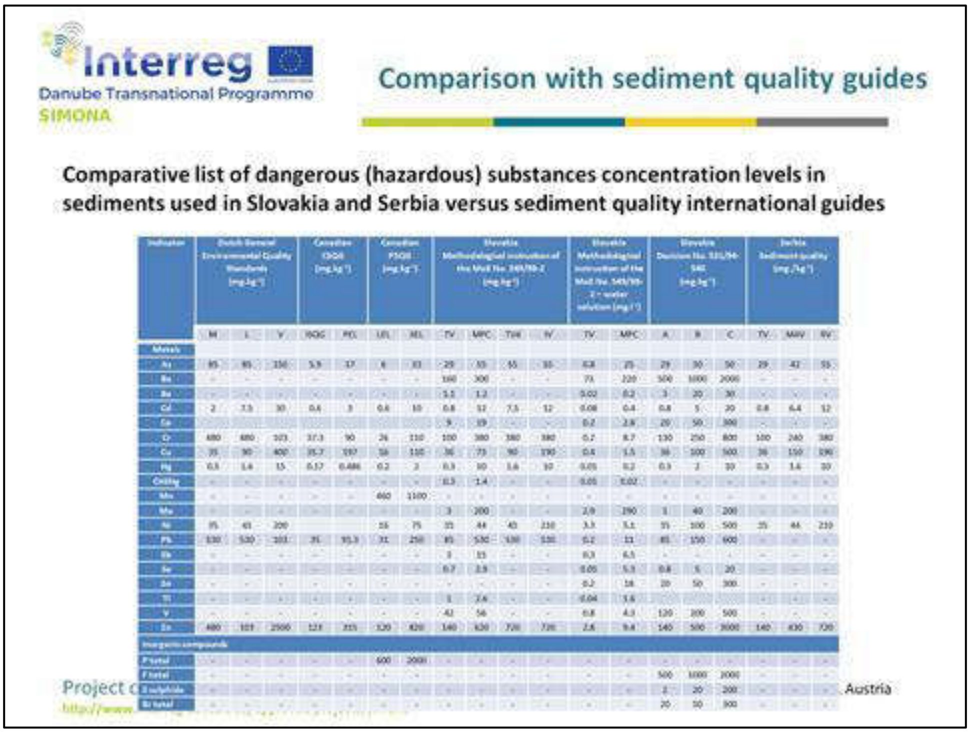

Interreg
Danube Transnational Programme
SIMONA
IV. INVENTORY OF LABORATORY METHODOLOGIES
IV.1. Mechanical preparation of samples
IV.2. Chemical preparation of samples and laboratory analysis
IV.2.1. Procedure for organic matter
IV.2.2. ICP-MS, ICP-AES systems
IV.2.3. AAS systems
IV.2.4. XRF
IV.2.5. DC-arc – AES
IV.2.6. Radionuclides
IV.2.7. Organic compounds (HSs)
IV.2.8. XRD
IV.3. Inventory of national laboratories
IV.4. Good practices
IV.5. Protocols
Project co-funded by the European Union
Inventory workshop, 10-11.04.2019, Austria

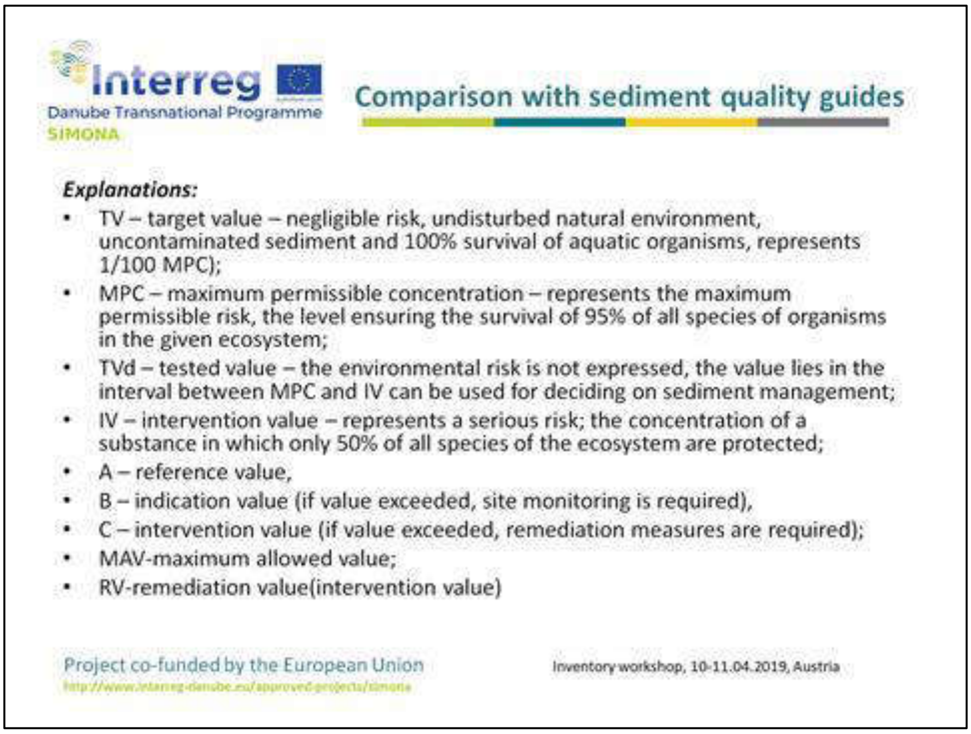

Interreg
Danube Transnational Programme
SIMONA
V. INVENTORY OF EVALUATION METHODS
V.1. Establishing threshold values for HSs
V.2. Fixed or variable threshold values for HSs
V.3. Corrections for threshold values
V.4. Basis of the environment quality objectives
V.5. "Bioaccumulation" in legislation
V.6. Categories of environment quality in national legislations
V.7. Number of media for defining the categories of environment quality
V.8. Algorithm for defining the categories of environment quality
V.9. Difference between contamination and pollution in national legislations
V.10. Relations between specific HSs and the contamination and pollution sources
V.11. Actions in case of contamination and pollution
V.12. Representations of results, targeted audience and avilability
V.13. Space-time risk assessment methods
Project co-funded by the European Union
Inventory workshop, 10-11.04.2019, Austria

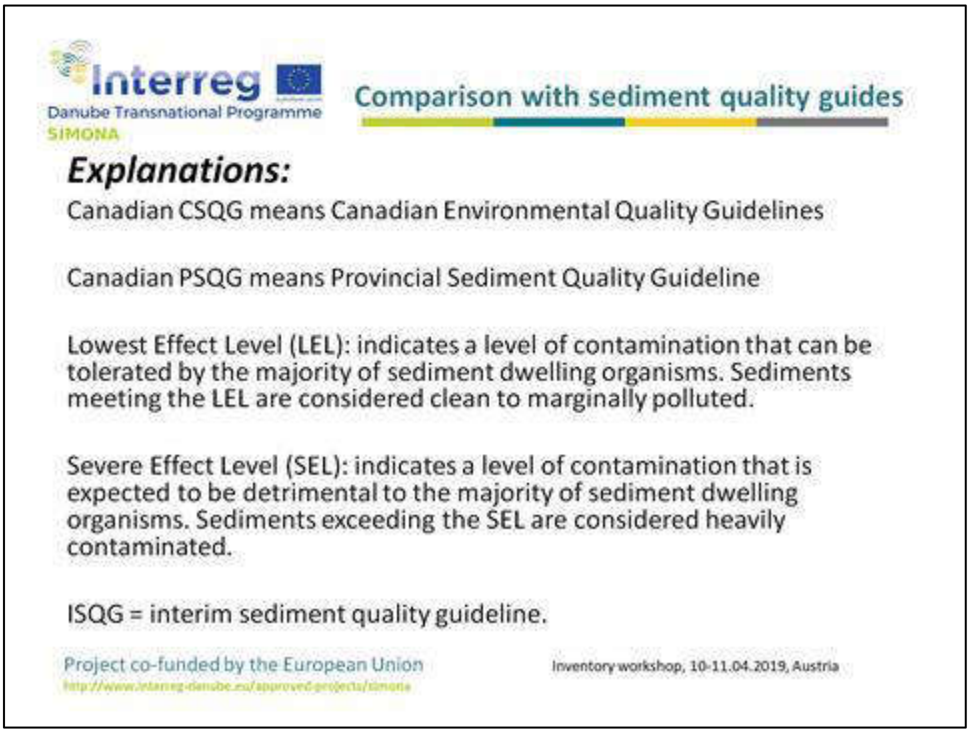

Interreg
Danube Transnational Programme
SIMONA
I. 1 National or/and European Legislation
The legislation was classified according to topic:
- Drinking water
- Surface and groundwater
- Waste (sewage) water
- Air
- Soil
- Sediments
7 tables were made with the legislation in national language and English for the above topics.
Project co-funded by the European Union
Inventory workshop, 10-11.04.2019, Austria


Interreg
Danube Transnational Programme
SIMONA
I. 1 National or/and European Legislation
CONCLUSIONS:
- Every country has national legislation related to water (drinking water, surface and groundwater, soils)
- EU water legislation is implemented in all countries, and the water bodies are monitored, in line with EU-WFD
- Few countries (Slovakia, Serbia) have specific legislation for sediments.
- Some countries (e.g. Romania, Slovenia) have some previsions related to sediments in the laws regarding water.
- In all countries there is additional legislation regarding environment protection (limiting, reducing or forbidding toxic emission and discharge).
Project co-funded by the European Union
Inventory workshop, 10-11.04.2019, Austria


Interreg
Danube Transnational Programme
SIMONA
I. 2 List of hazardous substances in waters, soils sediments and biota
Tables were made for all countries regarding:
- Definitions of maximum and minimum/normal content of elements in water – in order to establish common thresholds. Difficult issue, as some legislations foresee one set of values, while others foresee more classes of values. Furthermore, some chemical elements have more thresholds, depending on water hardness.
- Maximum, respectively normal content of major elements and trace elements in river water
- Maximum, respectively normal content of major elements and trace elements in drinking water
- Definitions of maximum and minimum/normal content of elements in soils. Difficult issue, as some legislations foresee one set of values, while others foresee more classes of values, for different soil types (sandy, silty, clay soil etc.)
- Maximum, respectively normal content of major elements and trace elements in soils
- Maximum, respectively normal content of trace elements in river sediments
- Normal content of major elements in river sediments (only Slovakia)
Project co-funded by the European Union
Inventory workshop, 10-11.04.2019, Austria


Interreg
Danube Transnational Programme
SIMONA
Comparison with sediment quality guides
Comparative list of dangerous (hazardous) substances concentration levels in sediments used in Slovakia and Serbia versus sediment quality international guides
Project c
http://www.
Austria


Interreg
Danube Transnational Programme
SIMONA
Comparison with sediment quality guides
Explanations:
• TV – target value – negligible risk, undisturbed natural environment, uncontaminated sediment and 100% survival of aquatic organisms, represents 1/100 MPC);
• MPC – maximum permissible concentration – represents the maximum permissible risk, the level ensuring the survival of 95% of all species of organisms in the given ecosystem;
• TVd – tested value – the environmental risk is not expressed, the value lies in the interval between MPC and IV can be used for deciding on sediment management;
• IV – intervention value – represents a serious risk; the concentration of a substance in which only 50% of all species of the ecosystem are protected;
• A – reference value,
• B – indication value (if value exceeded, site monitoring is required),
• C – intervention value (if value exceeded, remediation measures are required);
• MAV-maximum allowed value;
• RV-remediation value(intervention value)
Project co-funded by the European Union
Inventory workshop, 10-11.04.2019, Austria


Interreg
Danube Transnational Programme
SIMONA
Comparison with sediment quality guides
Explanations:
Canadian CSQG means Canadian Environmental Quality Guidelines
Canadian PSQG means Provincial Sediment Quality Guideline
Lowest Effect Level (LEL): indicates a level of contamination that can be tolerated by the majority of sediment dwelling organisms. Sediments meeting the LEL are considered clean to marginally polluted.
Severe Effect Level (SEL): indicates a level of contamination that is expected to be detrimental to the majority of sediment dwelling organisms. Sediments exceeding the SEL are considered heavily contaminated.
ISQG = interim sediment quality guideline.
Project co-funded by the European Union
Inventory workshop, 10-11.04.2019, Austria

Interreg Danube Transnational Programme SIMONA

I. 2 List of hazardous substances in waters, soils sediments and biota

CONCLUSIONS

- In the list of dangerous substances (molecular compounds) in soils, all partner countries took into account besides chemical elements (heavy metals, non-metals) and their molecular compounds that are known to be sometimes more toxic than the elements as such, but also other molecular organic compounds: polycyclic aromatic hydrocarbons - PAHs, polychlorinated biphenyls - PCBs, insecticides based on chlorinated hydrocarbon, herbicides or the particular values of each component. A large number of other parameters are laid down in legislation for both water and soils.
- A short list found in most of the lists (according to annexes 2-15) includes:
  - 16 PAHs - mononuclear and polynuclear aromatic compounds (Benzen, Etil-benzen, Toluen, Xilen, Stiren, Fenol, Benz(a)piren, Naftalina, Antracen, Fenantren, Fluoranten, Benzo(a)antracen, Crisen, Benz(ghi)perilen, Indeno(1,2,3-cd)piren, Benz(k)fluoranten).
  - 7 PCBs Bifenilipoliclorurat (PCB28, PCB52, PCB101, PCB118, PCB138, PCB153, PCB180)
  - 11 pesticides gamma-HCH (lindan); HCH (suma alfa-, beta-, delta-HCH); DDT/DDD/DDE (suma); Aldrin; Dieldrin; Endrin; Drinuri (as sum) Atrazin; Endosulfan; Heptaclor; organo-stanic coumpounds.
- For this minimal list, it is necessary to compare the maximum and normal values as set out in the national legislation, in the EU-WDF and in the Sediment Quality Guides.
- It is worth mentioning that in the aquatic environment the danger of chemical elements resulting from biochemical activity must be analyzed for establishing the list of hazardous substances.
- For drinking water or bathing water all countries have threshold limit values of microbiological indicators, such as *Intestinal Enterococci* [CFU/100 ml] and *Escherichia coli* [CFU/100 ml]. A series of aditional bacteria are foreseen in the list.

Project co-funded by the European Union
http://www.interreg-danube.eu/approved-projects/simona
Inventory workshop, 10-11.04.2019, Austria

Interreg Danube Transnational Programme SIMONA

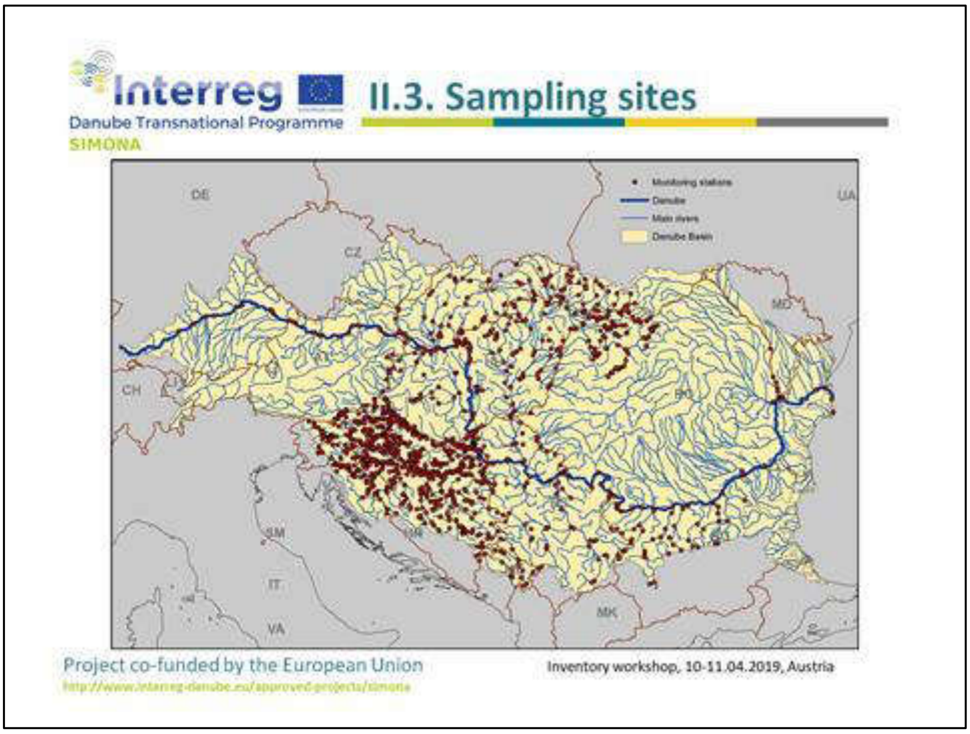
I.3. Quality objectives for HSs

The surface or groundwater bodies' quality is established on the basis of the values of certain parameters and the classification is adopted by the majority of SIMONA countries.

Example of classifying a water body in four categories based on chemical and physical parameters - Yearly average threshold limit values for surface water and quality standards for water biota - Croatia

Indicator	very good	good	moderate	bad
Transparency [m]	> 10	< 10	< 3	< 3
Oxygen saturation [%]	80 – 120	surface layer: 120 – 170 bottom layer: 30 – 80	surface layer: > 170 bottom layer: 30 – 80	surface layer: > 170 bottom layer: 0 – 30
Dissolved anorganic nitrogen [µmol/l]	< 2	< 10	< 20	> 20
Dissolved phosphorous [µmol/l]	< 0.3	< 0.6	< 1.3	> 1.3
Chlorophyll a [µ/l]	< 1	< 5	< 10	> 10
TRIX	2 – 4	4 – 5	5 – 6	6 – 8

Project co-funded by the European Union
http://www.interreg-danube.eu/approved-projects/simona
Inventory workshop, 10-11.04.2019, Austria

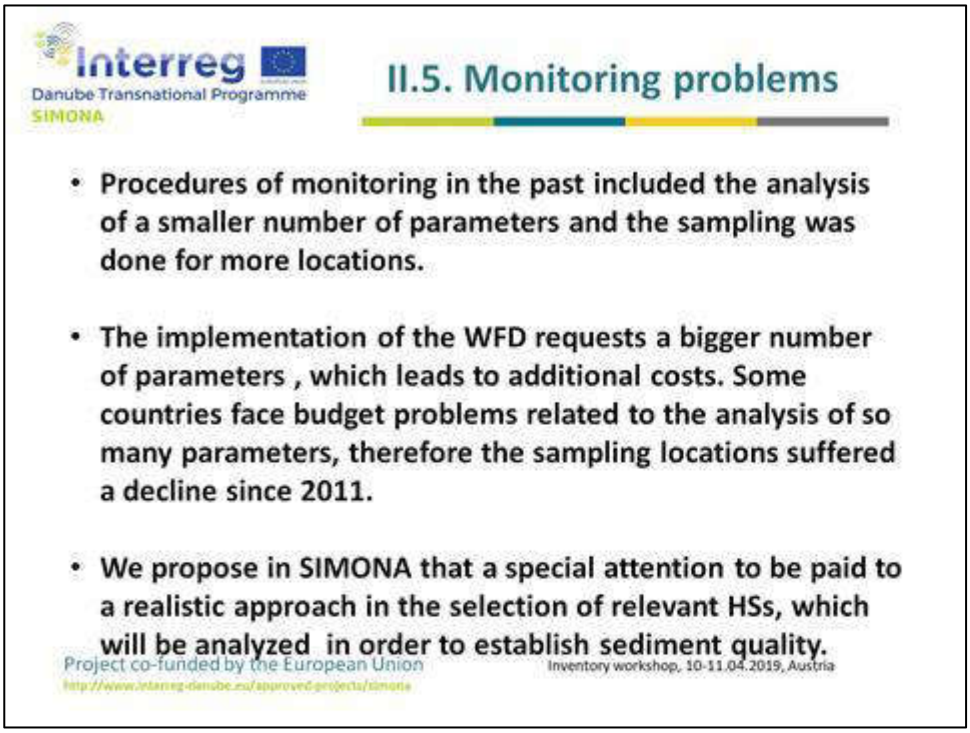


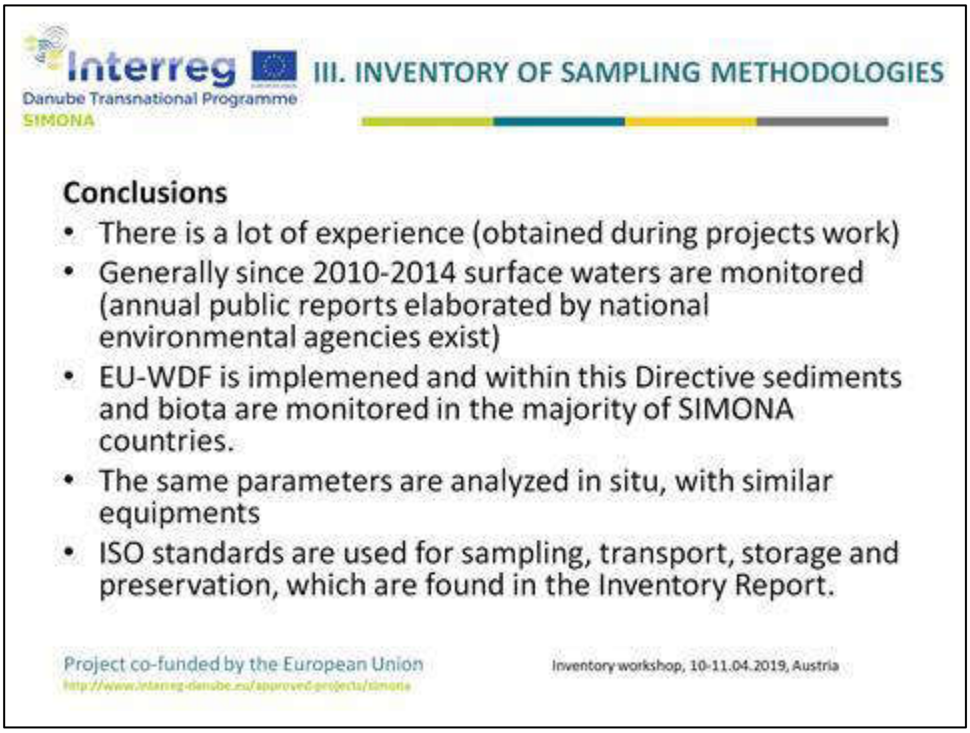
Interreg
Danube Transnational Programme
SIMONA

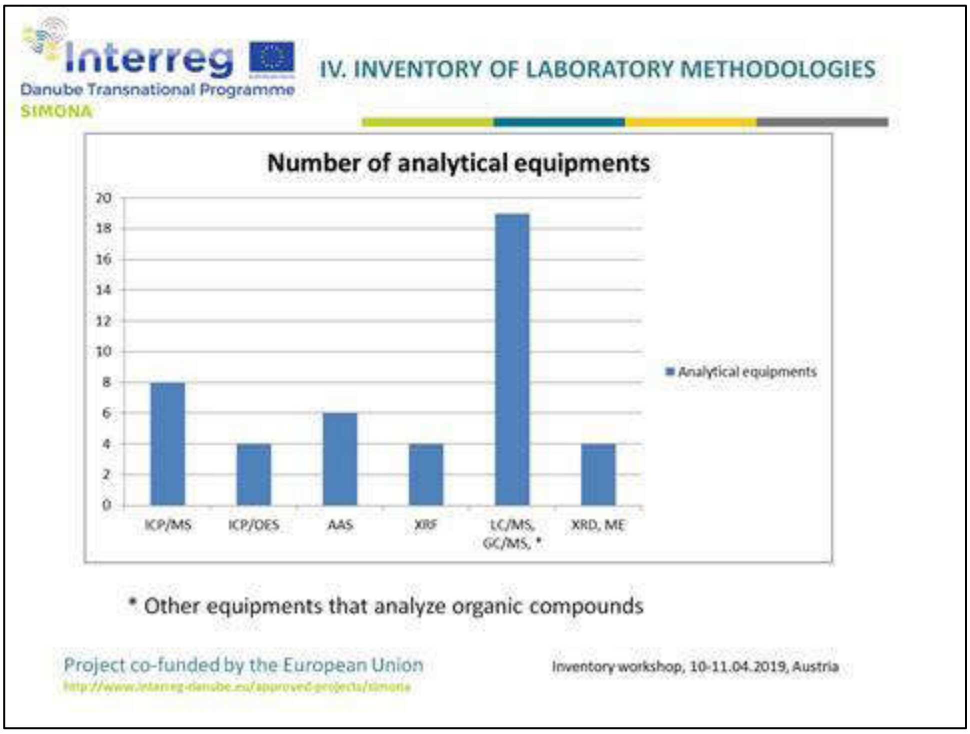
II.4. Polluters data availability

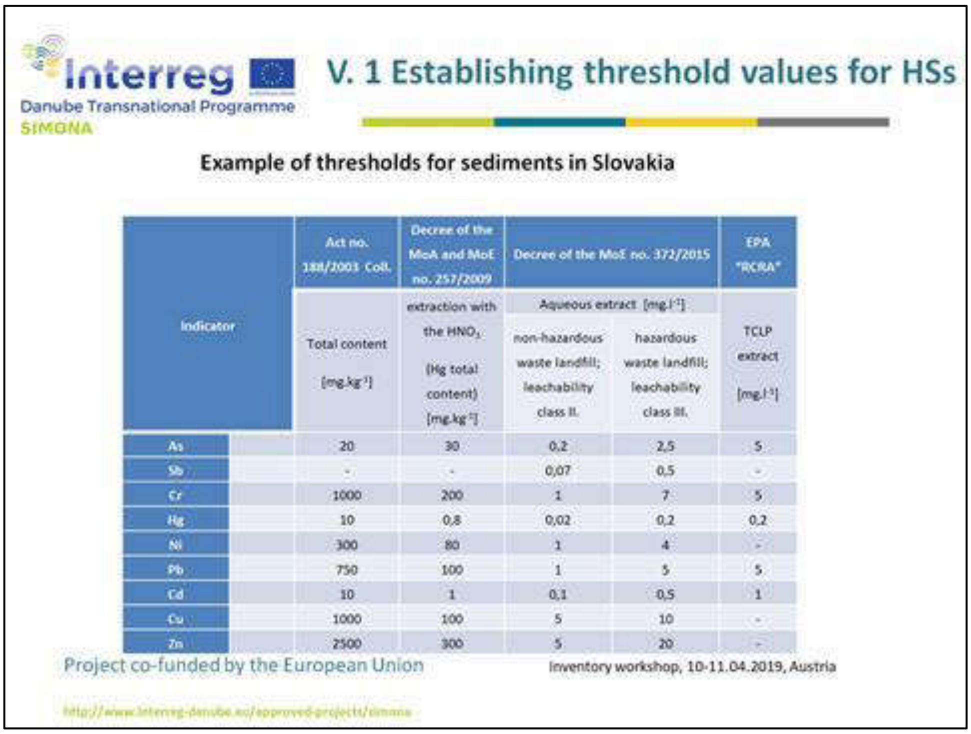
- **Some countries listed the main economic polluters, indicating also the polluting activities and the associated HSs.**
- **Some other countries gave a link to the pollutants.**
- **On the basis of these data (and of the list of big cities, legislation and literture data), which will be completed with relevant data by partner countries, the list of HSs for SIMONA project will be made.**

Project co-funded by the European Union
http://www.interreg-danube.eu/approved-projects/simona
Inventory workshop, 10-11.04.2019, Austria


Interreg
Danube Transnational Programme
SIMONA
II.5. Monitoring problems
• Procedures of monitoring in the past included the analysis of a smaller number of parameters and the sampling was done for more locations.
• The implementation of the WFD requests a bigger number of parameters , which leads to additional costs. Some countries face budget problems related to the analysis of so many parameters, therefore the sampling locations suffered a decline since 2011.
• We propose in SIMONA that a special attention to be paid to a realistic approach in the selection of relevant HSs, which will be analyzed in order to establish sediment quality.
Project co-funded by the European Union
Inventory workshop, 10-11.04.2019, Austria


Interreg
Danube Transnational Programme
SIMONA
III. INVENTORY OF SAMPLING METHODOLOGIES
Conclusions
• There is a lot of experience (obtained during projects work)
• Generally since 2010-2014 surface waters are monitored (annual public reports elaborated by national environmental agencies exist)
• EU-WDF is implemened and within this Directive sediments and biota are monitored in the majority of SIMONA countries.
• The same parameters are analyzed in situ, with similar equipments
• ISO standards are used for sampling, transport, storage and preservation, which are found in the Inventory Report.
Project co-funded by the European Union
Inventory workshop, 10-11.04.2019, Austria





Example of thresholds for sediments in Slovakia

Indicator	Act no. 188/2003 Coll.	Decree of the MoA and MoE no. 257/2009	Decree of the MoE no. 372/2015		EPA "RCRA"
	Total content [mg.kg⁻¹]	extraction with the HNO_3 (Hg total content) [mg.kg⁻¹]	Aqueous extract [mg.l⁻¹] non-hazardous waste landfill; leachability class II.	Aqueous extract [mg.l⁻¹] hazardous waste landfill; leachability class III.	TCLP extract [mg.l⁻¹]
As	20	30	0,2	2,5	5
Sb	-	-	0,07	0,5	-
Cr	1000	200	1	7	5
Hg	10	0,8	0,02	0,2	0,2
Ni	300	80	1	4	-
Pb	750	100	1	5	5
Cd	10	1	0,1	0,5	1
Cu	1000	100	5	10	-
Zn	2500	300	5	20	-

Interreg Danube Transnational Programme SIMONA

V. 8 Algorithm for defining the environment quality categories

In Ukraine:
Total pollution factor (Zc) :

$Zc = \sum Ci/Cb - (n-1)$,

Ci – the content of the chemical element in the sample;
Cb – background content of the chemical element;
n- number of chemical elements in the sample with abnormal content (Ci/Cb>2).

Tentative scale of estimation of pollution of rivers by intensity of accumulation of chemical elements in bottom sediments.

Zc	Level of technogenic pollution	Level of sanitary-toxicological danger	toxic elements concentration in river water
< 10	Weak	Allowable	Most elements within the background
10-30	Medium	Moderate	Most elements exceed the background, and some reach the level of MPC
30-100	High	Dangerous	Some elements exceed the MPC level
100-300	Very high	Very dangerous	Most items exceed the MPC level
>300	Extremely high	Extremely dangerous	Most elements consistently exceed the MPC level

Project co-fun... .2019, Austria
http://www.interreg...

Interreg Danube Transnational Programme SIMONA

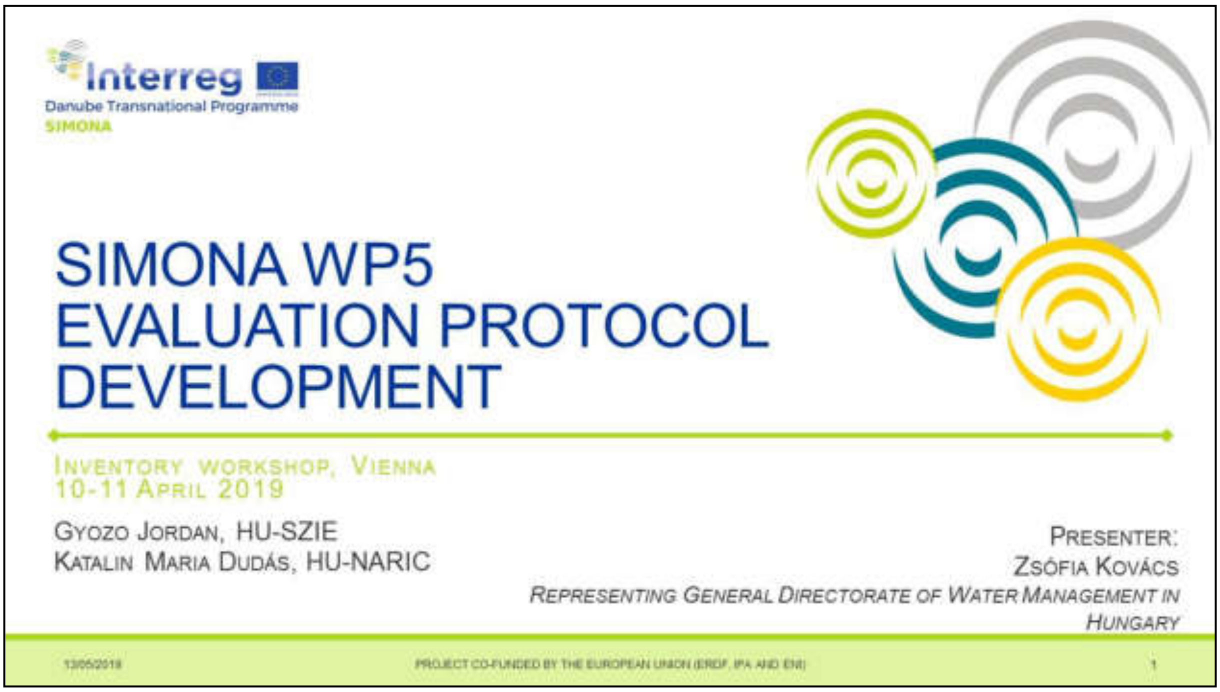
V. INVENTORY OF EVALUATION METHODS

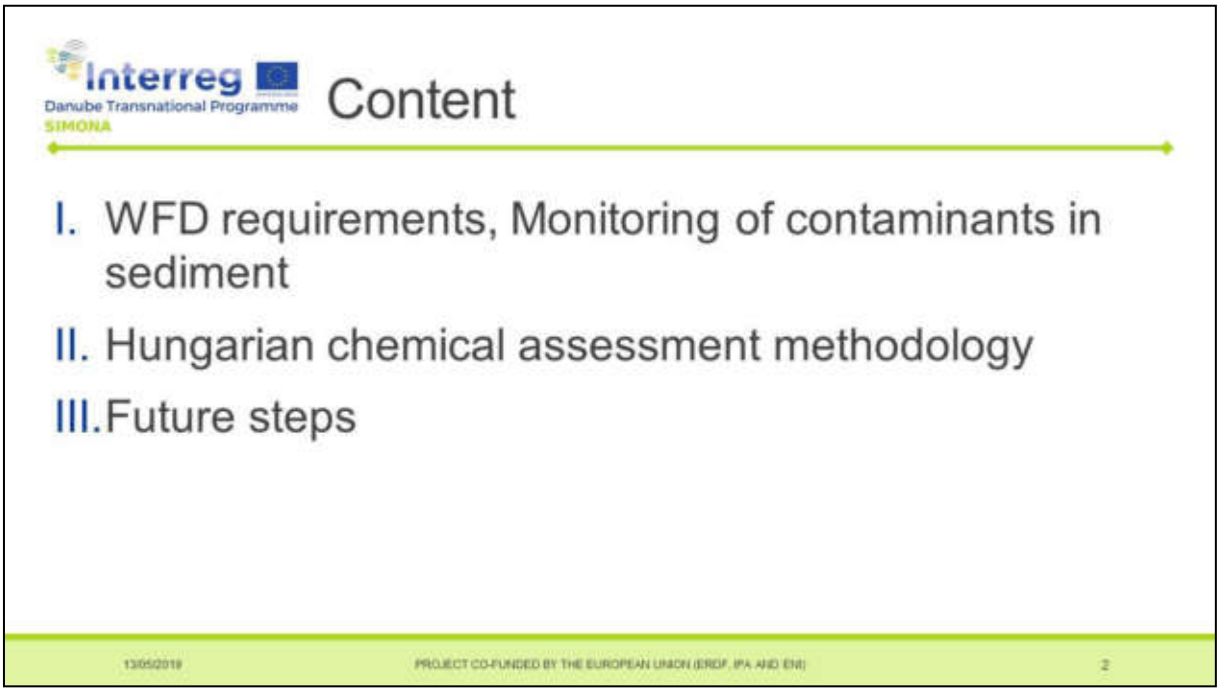
CONCLUSIONS

- The quality standard values are established in legislative acts.
- Some legislations take into account the natural background concentrations of metals and their compounds, water hardness, pH, dissolved organic carbon for water, soil type (clay, sand, silt), the geological features of underground or surface waters .
- Some legislations take into account the fact that sometimes an metal is more toxic in some of its molecular compounds (especially in the aquatic environment). Therefore, besides "Total Metal Analysis", analyzes of metal compounds are also done.
- The legislations reflect to a small extent the phenomenon of selective bioaccumulation and traceability of metals (the accumulation of mercury in big fish or PAH in certain biota).
- Due to the general character of legislations, establishing a zonal bioconcentration factor associated with a certain type of biota can be done only with the help of a zonal guide. This will be the role of SIMONA project.
- Legislations generally do not specify exact methods for remedying pollution because the laws have a general character. When developing a zonal guide, dedicated to a certain ecosystem (e.g. the aquatic Danube ecosystem), these remediation methods must be reflected.
- There are differences regarding the establishment of ecological quality classes, although the classification criteria are generally the same.

Project co-funded by the European Union — Inventory workshop, 10-11.04.2019, Austria
http://www.interreg-danube.eu/approved-projects/simona

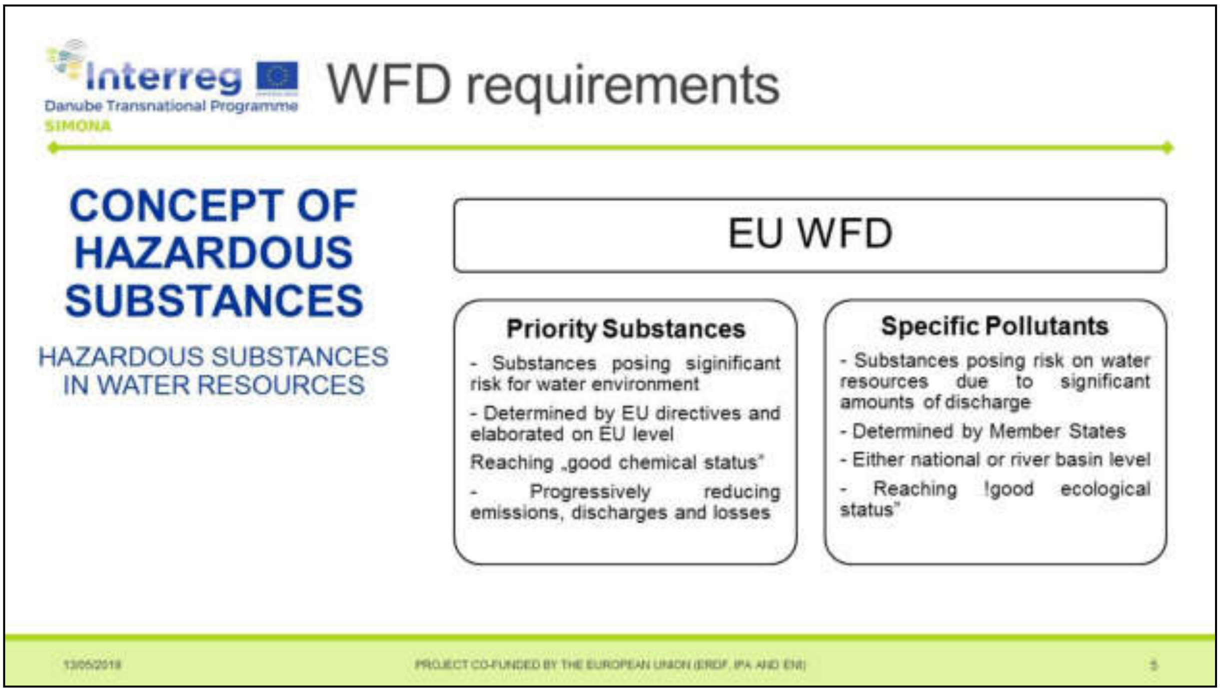
II.3. Protocol development, CIS guidance, WFD framework



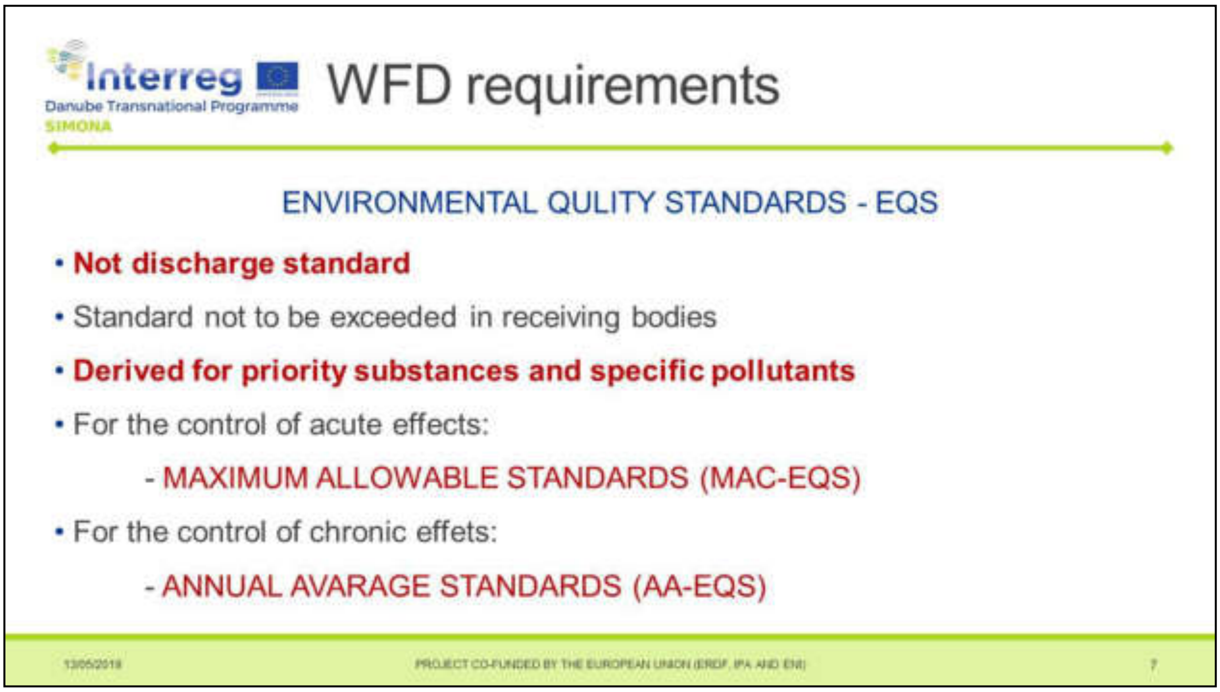


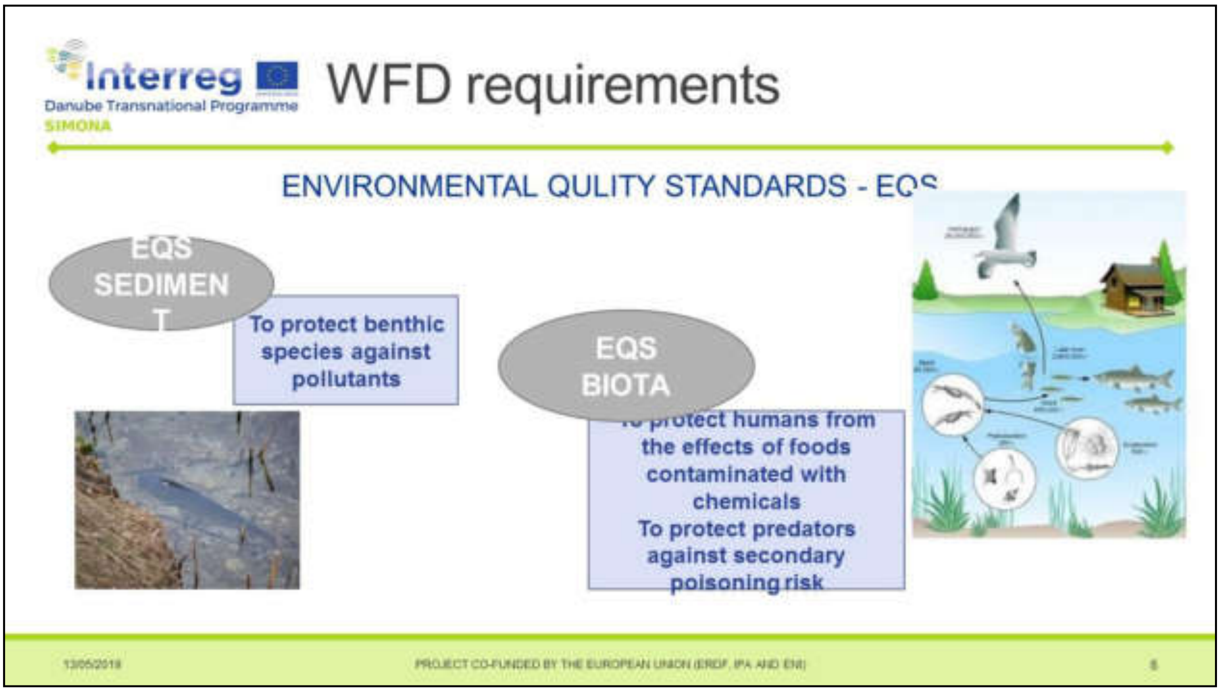

Interreg
Danube Transnational Programme
SIMONA
I. WFD REQUIREMENTS
MONITORING OF CONTAMINANTS IN SEDIMENT
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
3


Interreg
Danube Transnational Programme
SIMONA
WFD requirements
LEGAL FRAMEWORK – EU LEGISLATION
Water Framework Directive (WFD, 2000/60/EC)
The objective of the WFD is to achieve good ecological and chemical status in all bodies (2015, 2021,2027).
Environmental Quality Standards Directive (2008/105/EC)
Objective: Setting forth the priority substances and corresponding environmental quality standards with the aim of achieving "good surface water chemical status" in EU member states
Annex I: 33 priority substances and 8 other pollutants and corresponding environmental quality standards for water column
Directive Amending Directives 2000/60/EC and 2008/105/EC as Regards Priority Substances in the field of water policy 2013/39/EU
Maximum and annual average environmental quality standards for 45 priority substances and 8 other pollutants in water column
Biota environmental quality standards for 11 priority substances
The CIS Guidance Document 19 and 25
The objective of the WFD is to achieve good ecological and chemical status in all bodies of surface water, ground water and artificial water bodies and very modified water bodies by 2015, 2021 and 2027.
13/05/2019
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
4


Interreg
Danube Transnational Programme
SIMONA
WFD requirements
CONCEPT OF HAZARDOUS SUBSTANCES
HAZARDOUS SUBSTANCES IN WATER RESOURCES
EU WFD
Priority Substances
- Substances posing siginificant risk for water environment
- Determined by EU directives and elaborated on EU level
Reaching „good chemical status"
- Progressively reducing emissions, discharges and losses
Specific Pollutants
- Substances posing risk on water resources due to significant amounts of discharge
- Determined by Member States
- Either national or river basin level
- Reaching !good ecological status"
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)


Interreg
Danube Transnational Programme
SIMONA
WFD requirements
WAY TO CONTROL IN WATER - EQS
IMPLEMENTATION OF ENVIRONMENTAL QUALITY STANDARDS (EQS) FOR MANAGEMENT OF PRIORITY SUBSTANCES AND SPECIFIC POLLUTANTS!
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)


Interreg
Danube Transnational Programme
SIMONA
WFD requirements
ENVIRONMENTAL QULITY STANDARDS - EQS
• Not discharge standard
• Standard not to be exceeded in receiving bodies
• Derived for priority substances and specific pollutants
• For the control of acute effects:
- MAXIMUM ALLOWABLE STANDARDS (MAC-EQS)
• For the control of chronic effets:
- ANNUAL AVARAGE STANDARDS (AA-EQS)
13/05/2019
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
7


Interreg
Danube Transnational Programme
SIMONA
WFD requirements
ENVIRONMENTAL QULITY STANDARDS - EQS
EQS SEDIMENT
To protect benthic species against pollutants
EQS BIOTA
To protect humans from the effects of foods contaminated with chemicals
To protect predators against secondary poisoning risk
13/05/2019
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
8

WFD requirements

BACKGROUND INFORMATION, GUIDANCE DOCUMENTS

In addition to chemical and ecological status assessment, the prevention of further deterioration of the status of aquatic ecosystems is another important objective of the WFD.

Monitoring of contaminants in sediment and biota may be used to assess the long-term impacts of anthropogenic activity and thus, to assess the achievement of the above mentioned objective. It includes the determination of the extent and rate of changes in levels of environmental contamination.

13/05/2019 PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI) 9

Monitoring of contaminants in sediment

13/05/2019 PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI) 10

Interreg
Danube Transnational Programme
SIMONA

Monitoring of contaminants in sediment

TO ASSESS THE LONG-TERM IMPACTS OF ANTHROPOGENIC ACTIVITY

Hydrophobic and lipophilic substances that tend to accumulate in sediment may be monitored in sediment for resource effective trend monitoring in order to:

- assess compliance with the no deterioration objective (concentrations of substances are below detection limits, declining or stable and there is no obvious risk of increase) of the WFD,
- assess long-term changes in natural conditions and those resulting from widespread anthropogenic activity,
- monitor the progressive reduction in the concentrations of priority substances (PS) and the phasing out of priority hazardous substances (PHS).

Source: CIS guidance No. 19. – 4.2.1.

13/05/2019 PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI) 11

Interreg
Danube Transnational Programme
SIMONA

Monitoring of contaminants in sediment

OTHER REASONS TO MEASURE CONTAMINANTS IN SEDIMENT

Use of sediment in monitoring priority (hazardous) substances is important in other issues of WFD implementations, viz.:

- identify the fate and behaviour of pollutants,
- describe the general contaminant status and supply reference values for regional and local monitoring programmes,
- accumulating matrices (sediment or biota) give an integrated and less variable measure of the contaminant burden over a longer time period, and consequently, an improved statistical power for time series analysis

Source: CIS guidance No. 19. – 4.2.1.

13/05/2019 PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI) 12

Interreg Danube Transnational Programme SIMONA

Monitoring of contaminants in sediment

LOCATIONS FOR SEDIMENT TREND MONITORING

Sediment samples should be

- collected from areas characterised by relatively low natural variability;
- A representative of a water body or a cluster of water bodies.
- performed in non-erosion areas.

Representativeness is a key point, i.e. how well a sample reflects a given area or how much area the sample represents given a certain level of statistical significance.

- For example, it is essential to collect specimens for analysis well away from the mixing zones when the sampling point is downstream of a significant discharge.

Source: CIS guidance No. 19. – 4.2.1.

13/05/2019 PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI) 13

Interreg Danube Transnational Programme SIMONA

Monitoring of contaminants in sediment

MONITORING FREQUENCIES

Typical sampling frequency will vary from

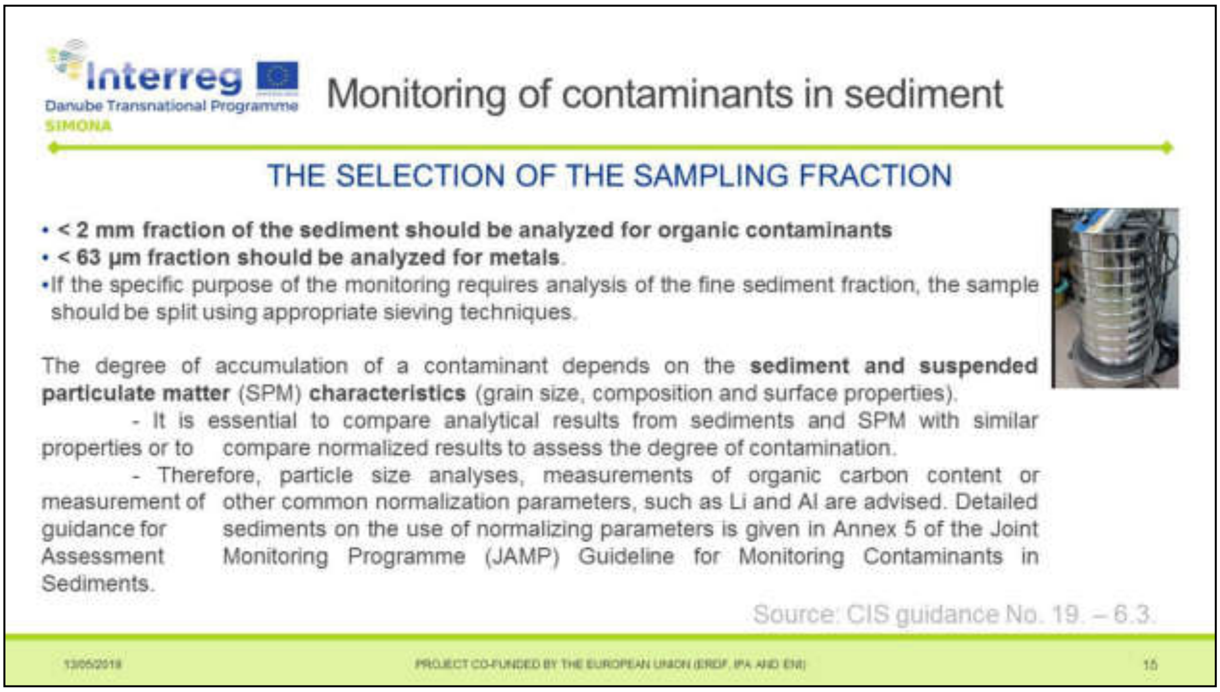
- **once every 1 to 3 years for large rivers** or estuaries that are characterized by high sedimentation rates, to
- **once every 6 years for lakes** or coastal areas with very low sedimentation rates.

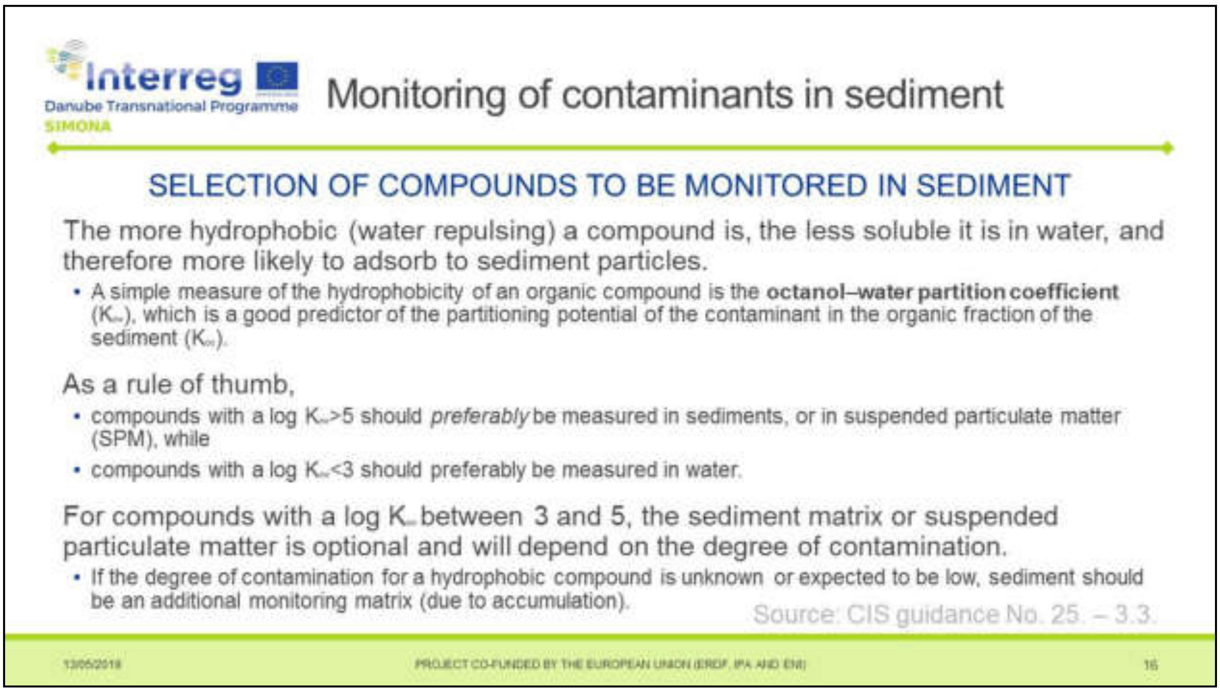
Sediment sampling appropriate frequency

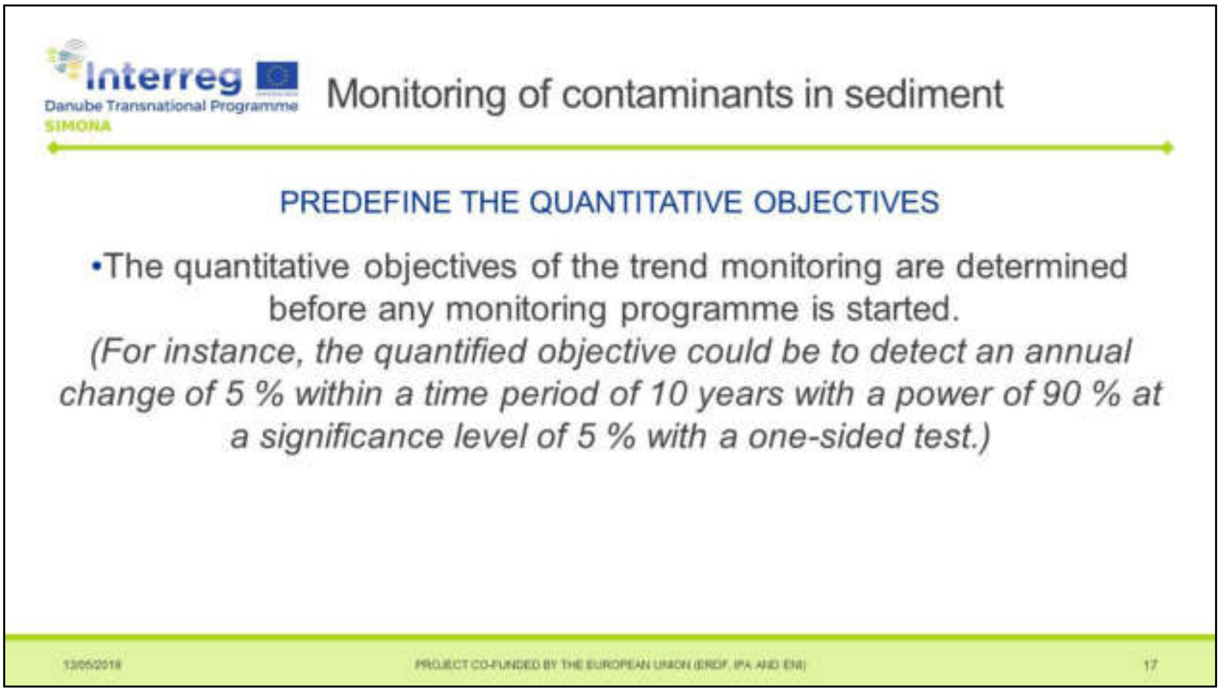
- have to be defined on a local basis = taking into account the sedimentation rate and hydrological conditions (e.g., flood events).

Source: CIS guidance No. 19. – 4.4.

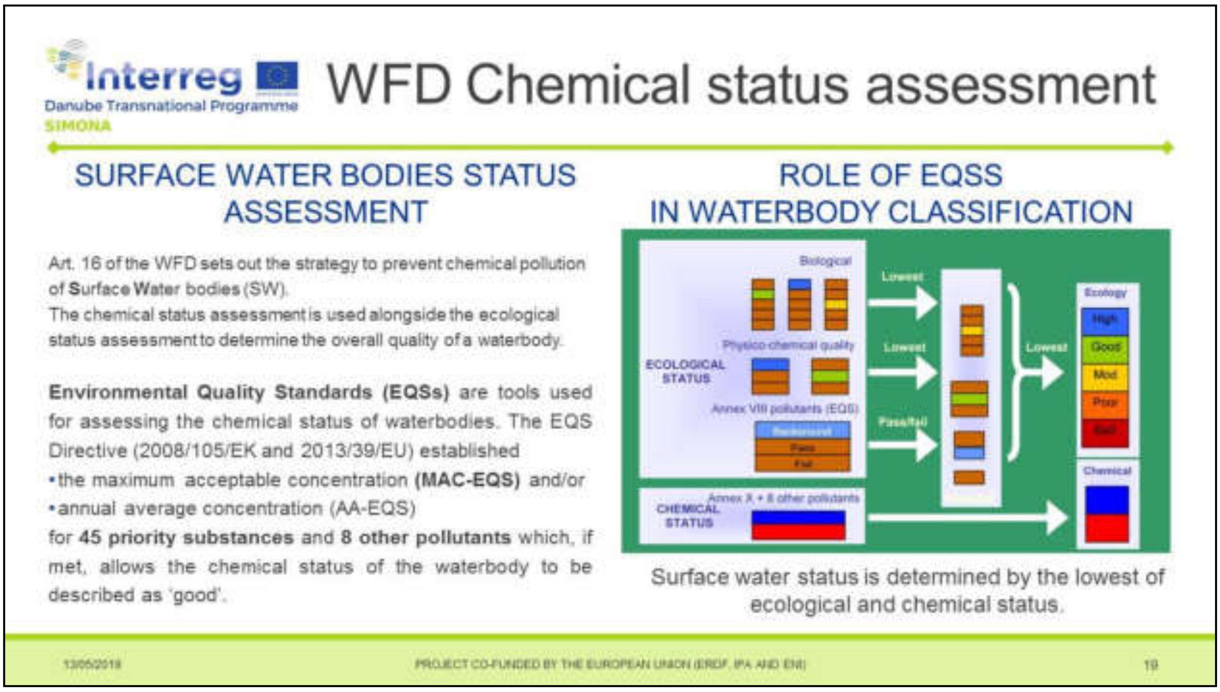
13/05/2019 PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI) 14

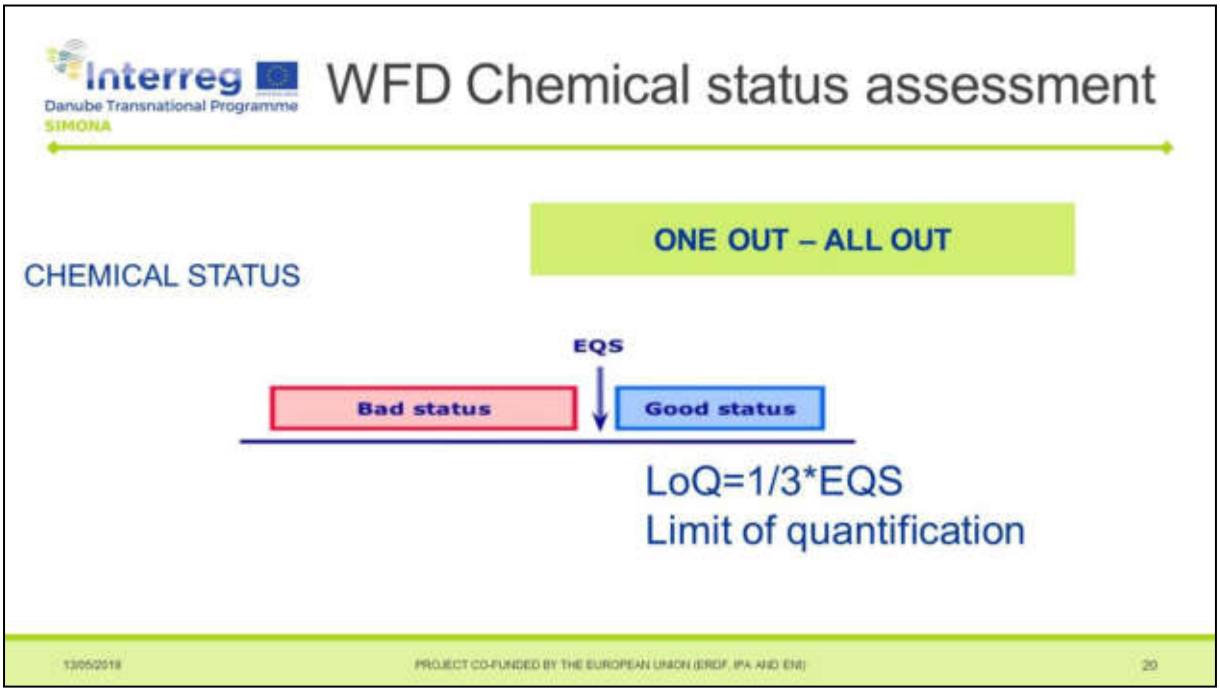

Interreg
Danube Transnational Programme
SIMONA
Monitoring of contaminants in sediment
THE SELECTION OF THE SAMPLING FRACTION
• < 2 mm fraction of the sediment should be analyzed for organic contaminants
• < 63 μm fraction should be analyzed for metals.
•If the specific purpose of the monitoring requires analysis of the fine sediment fraction, the sample should be split using appropriate sieving techniques.
The degree of accumulation of a contaminant depends on the sediment and suspended particulate matter (SPM) characteristics (grain size, composition and surface properties).
- It is essential to compare analytical results from sediments and SPM with similar properties or to compare normalized results to assess the degree of contamination.
- Therefore, particle size analyses, measurements of organic carbon content or measurement of other common normalization parameters, such as Li and Al are advised. Detailed guidance for sediments on the use of normalizing parameters is given in Annex 5 of the Joint Assessment Monitoring Programme (JAMP) Guideline for Monitoring Contaminants in Sediments.
Source: CIS guidance No. 19. – 6.3.

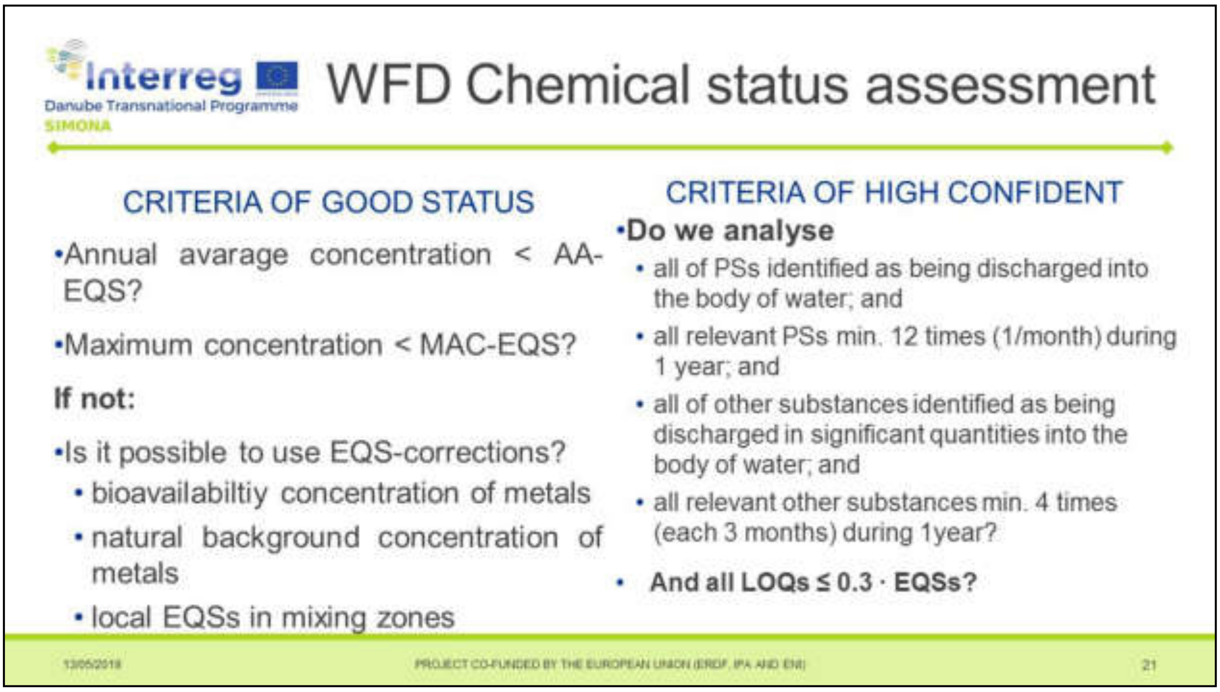

Interreg
Danube Transnational Programme
SIMONA
Monitoring of contaminants in sediment
SELECTION OF COMPOUNDS TO BE MONITORED IN SEDIMENT
The more hydrophobic (water repulsing) a compound is, the less soluble it is in water, and therefore more likely to adsorb to sediment particles.
• A simple measure of the hydrophobicity of an organic compound is the octanol–water partition coefficient (K_{ow}), which is a good predictor of the partitioning potential of the contaminant in the organic fraction of the sediment (K_{oc}).
As a rule of thumb,
• compounds with a log K_{ow}>5 should preferably be measured in sediments, or in suspended particulate matter (SPM), while
• compounds with a log K_{ow}<3 should preferably be measured in water.
For compounds with a log K_{ow} between 3 and 5, the sediment matrix or suspended particulate matter is optional and 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).
Source: CIS guidance No. 25. – 3.3.

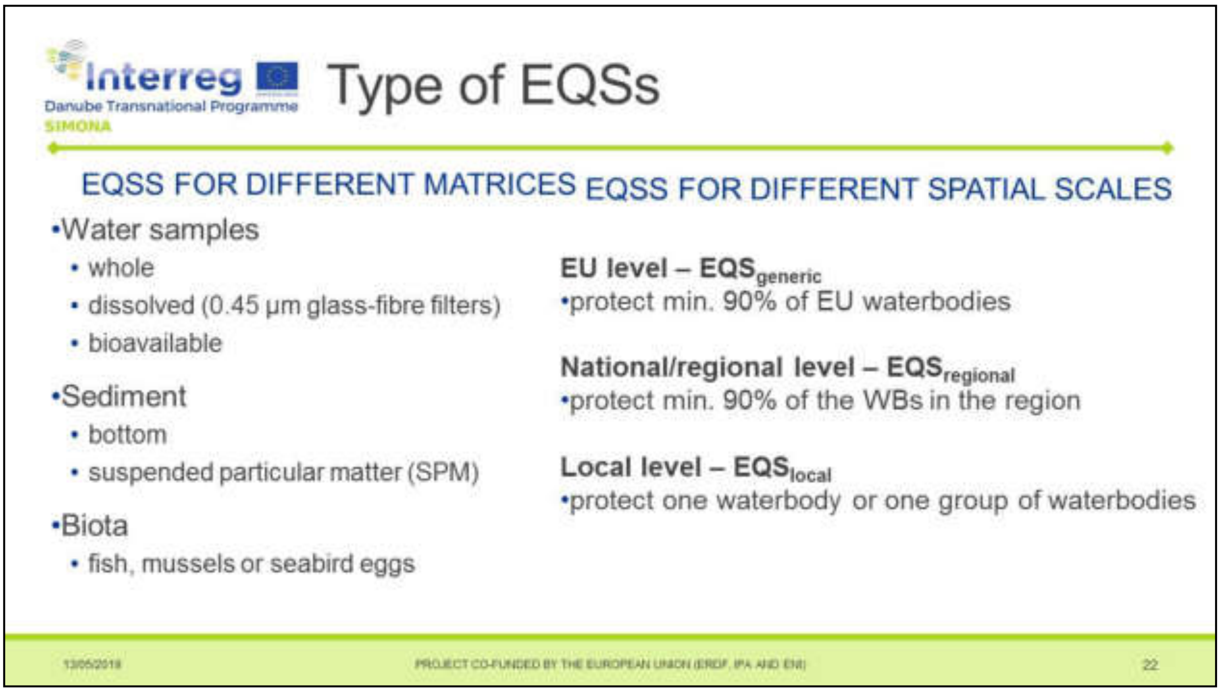

Interreg
Danube Transnational Programme
SIMONA
Monitoring of contaminants in sediment
PREDEFINE THE QUANTITATIVE OBJECTIVES
•The quantitative objectives of the trend monitoring are determined before any monitoring programme is started.
(For instance, the quantified objective could be to detect an annual change of 5 % within a time period of 10 years with a power of 90 % at a significance level of 5 % with a one-sided test.)
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
17

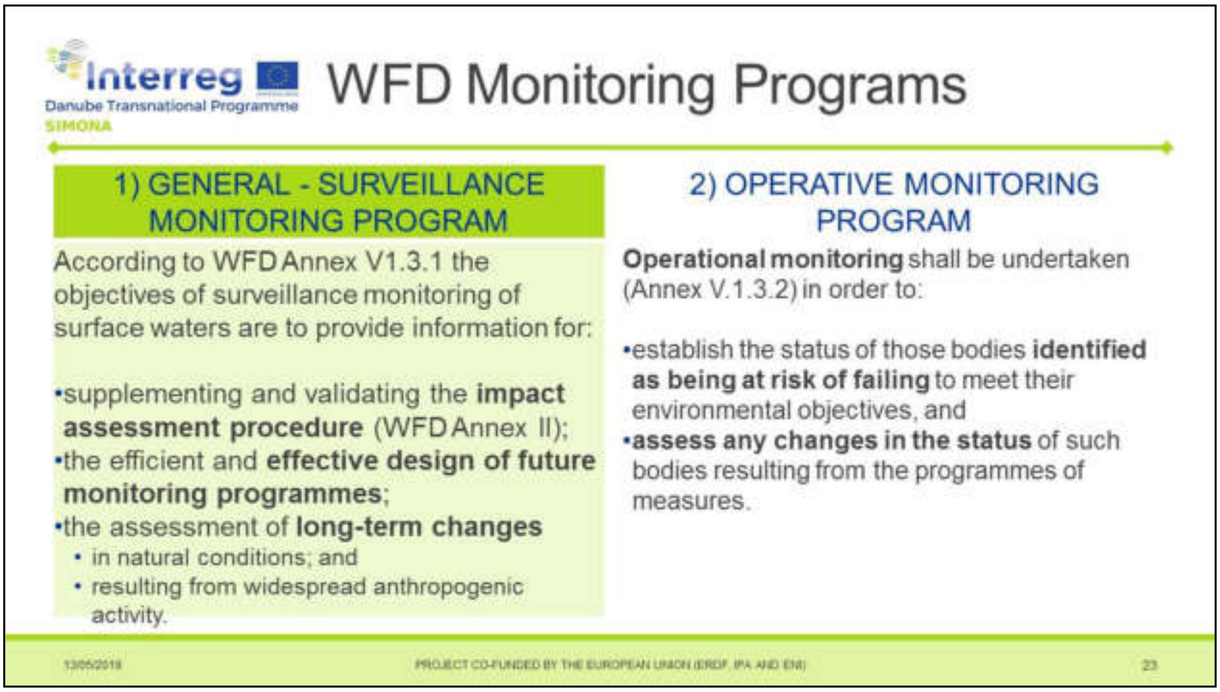

Interreg
Danube Transnational Programme
SIMONA
II. WFD EVALUATION METHODOLOGY – HUNGARIAN BEST PRACTICE
MONITORING PROGRAMS &
CHEMICAL STATUS ASSESSMENT
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)

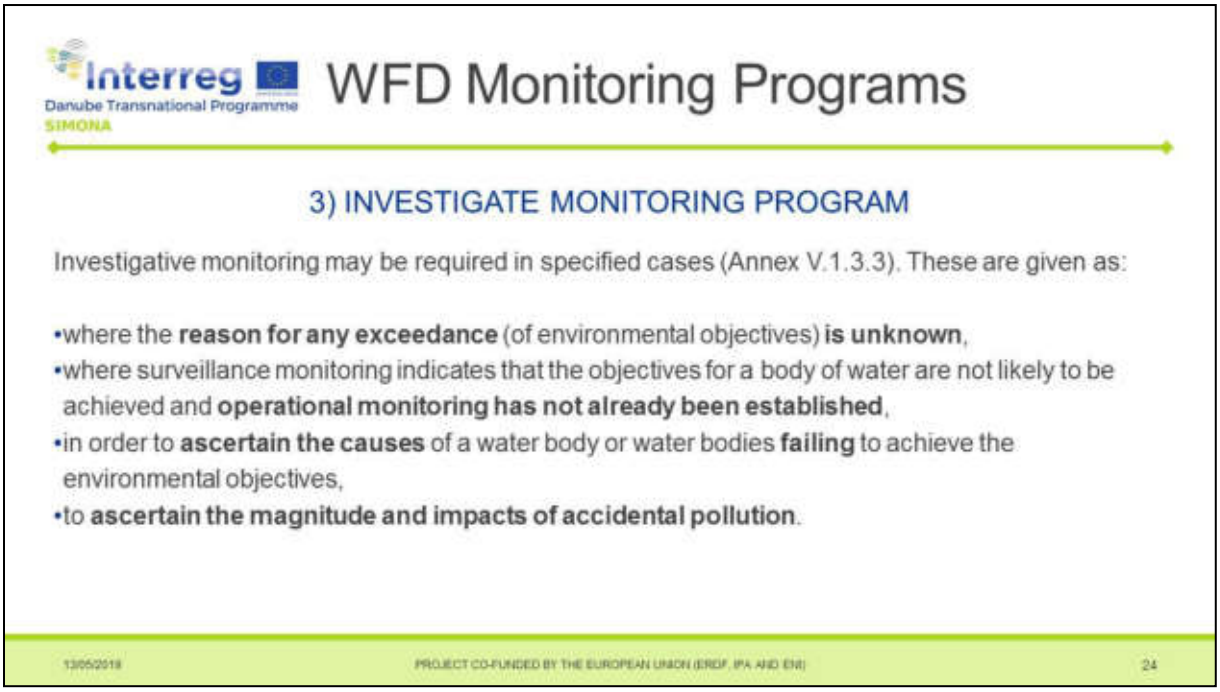

Interreg
Danube Transnational Programme
SIMONA
WFD Chemical status assessment
SURFACE WATER BODIES STATUS ASSESSMENT
Art. 16 of the WFD sets out the strategy to prevent chemical pollution of Surface Water bodies (SW).
The chemical status assessment is used alongside the ecological status assessment to determine the overall quality of a waterbody.
Environmental Quality Standards (EQSs) are tools used for assessing the chemical status of waterbodies. The EQS Directive (2008/105/EK and 2013/39/EU) established
•the maximum acceptable concentration (MAC-EQS) and/or
•annual average concentration (AA-EQS)
for 45 priority substances and 8 other pollutants which, if met, allows the chemical status of the waterbody to be described as 'good'.
ROLE OF EQSS
IN WATERBODY CLASSIFICATION
Biological
ECOLOGICAL STATUS
Physico-chemical quality
Annex VIII pollutants (EQS)
CHEMICAL STATUS
Annex X + 8 other pollutants
Lowest
Lowest
Pass/fail
Lowest
Ecology
High
Good
Mod
Poor
Bad
Chemical
Surface water status is determined by the lowest of ecological and chemical status.
13/05/2019
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
19

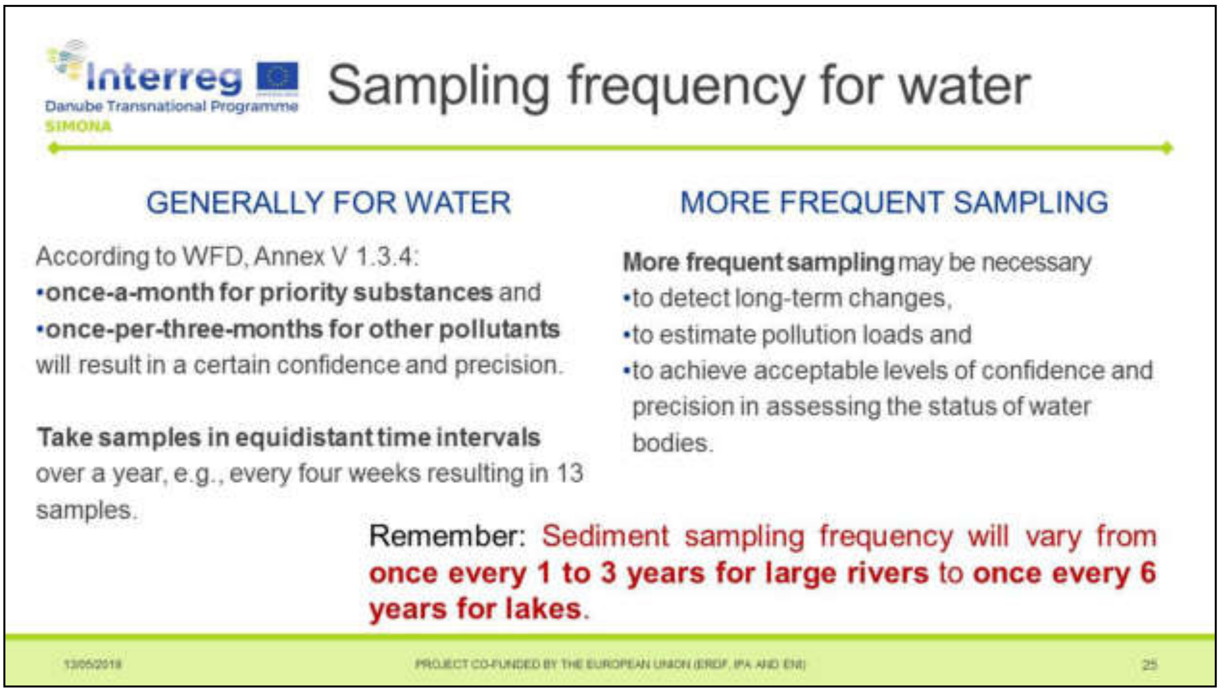

Interreg
Danube Transnational Programme
SIMONA
WFD Chemical status assessment
CHEMICAL STATUS
ONE OUT – ALL OUT
EQS
Bad status
Good status
LoQ=1/3*EQS
Limit of quantification
13/05/2019
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
20

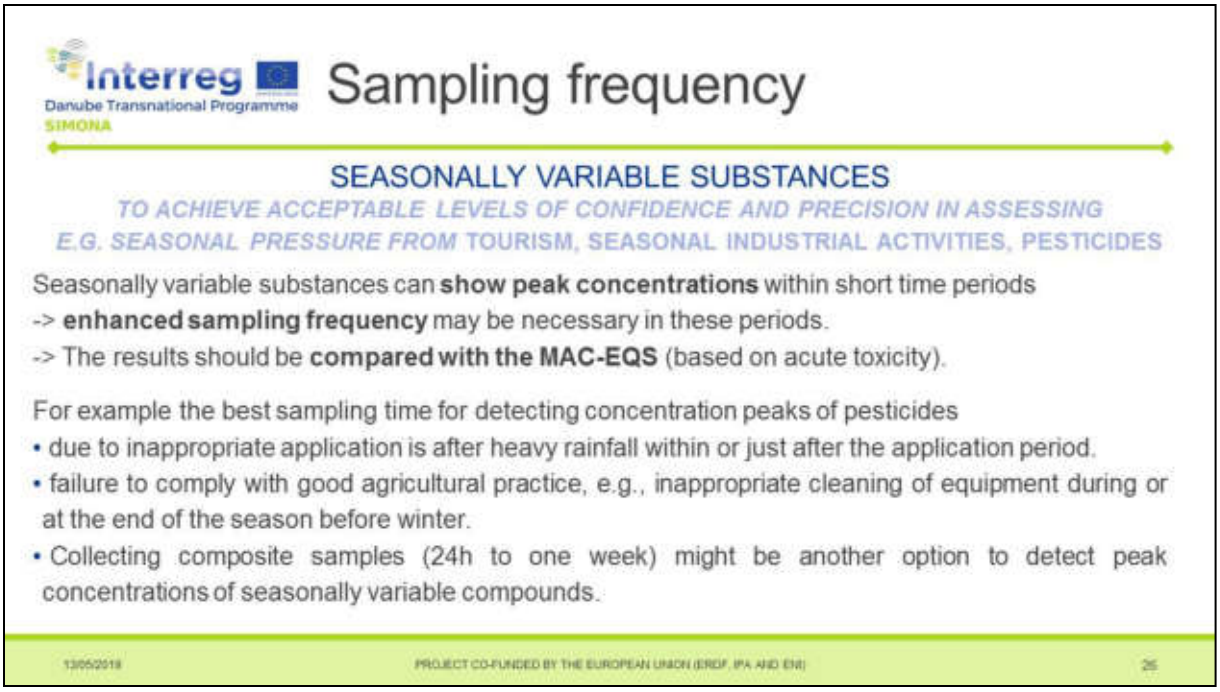

Interreg
Danube Transnational Programme
SIMONA
WFD Chemical status assessment
CRITERIA OF GOOD STATUS
•Annual avarage concentration < AA-EQS?
•Maximum concentration < MAC-EQS?
If not:
•Is it possible to use EQS-corrections?
• bioavailabiltiy concentration of metals
• natural background concentration of metals
• local EQSs in mixing zones
CRITERIA OF HIGH CONFIDENT
•Do we analyse
• all of PSs identified as being discharged into the body of water; and
• all relevant PSs min. 12 times (1/month) during 1 year; and
• all of other substances identified as being discharged in significant quantities into the body of water; and
• all relevant other substances min. 4 times (each 3 months) during 1year?
• And all LOQs ≤ 0.3 · EQSs?
13/05/2018
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
21

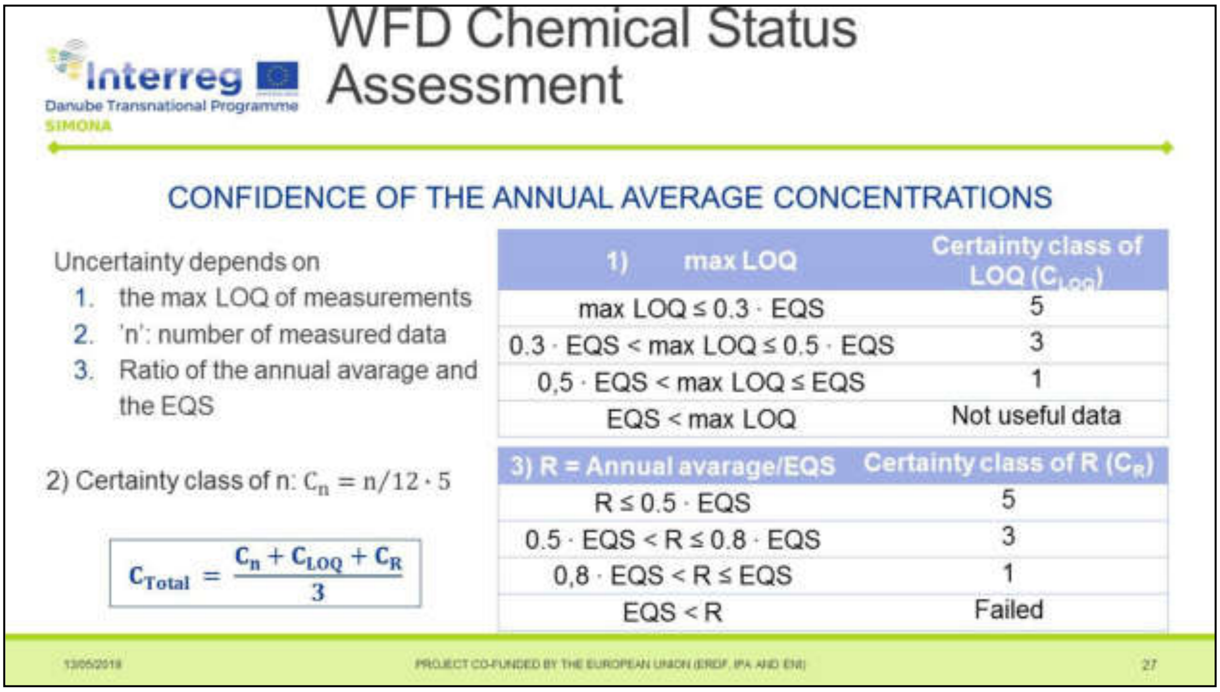

Interreg
Danube Transnational Programme
SIMONA
Type of EQSs
EQSS FOR DIFFERENT MATRICES
•Water samples
• whole
• dissolved (0.45 µm glass-fibre filters)
• bioavailable
•Sediment
• bottom
• suspended particular matter (SPM)
•Biota
• fish, mussels or seabird eggs
EQSS FOR DIFFERENT SPATIAL SCALES
EU level – $EQS_{generic}$
•protect min. 90% of EU waterbodies
National/regional level – $EQS_{regional}$
•protect min. 90% of the WBs in the region
Local level – EQS_{local}
•protect one waterbody or one group of waterbodies
13/05/2018
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
22


Interreg
Danube Transnational Programme
SIMONA
WFD Monitoring Programs
1) GENERAL - SURVEILLANCE MONITORING PROGRAM
According to WFD Annex V1.3.1 the objectives of surveillance monitoring of surface waters are to provide information for:
•supplementing and validating the **impact assessment procedure** (WFD Annex II);
•the efficient and **effective design of future monitoring programmes**;
•the assessment of **long-term changes**
• in natural conditions; and
• resulting from widespread anthropogenic activity.
2) OPERATIVE MONITORING PROGRAM
Operational monitoring shall be undertaken (Annex V.1.3.2) in order to:
•establish the status of those bodies **identified as being at risk of failing** to meet their environmental objectives, and
•**assess any changes in the status** of such bodies resulting from the programmes of measures.
13/05/2018
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
23

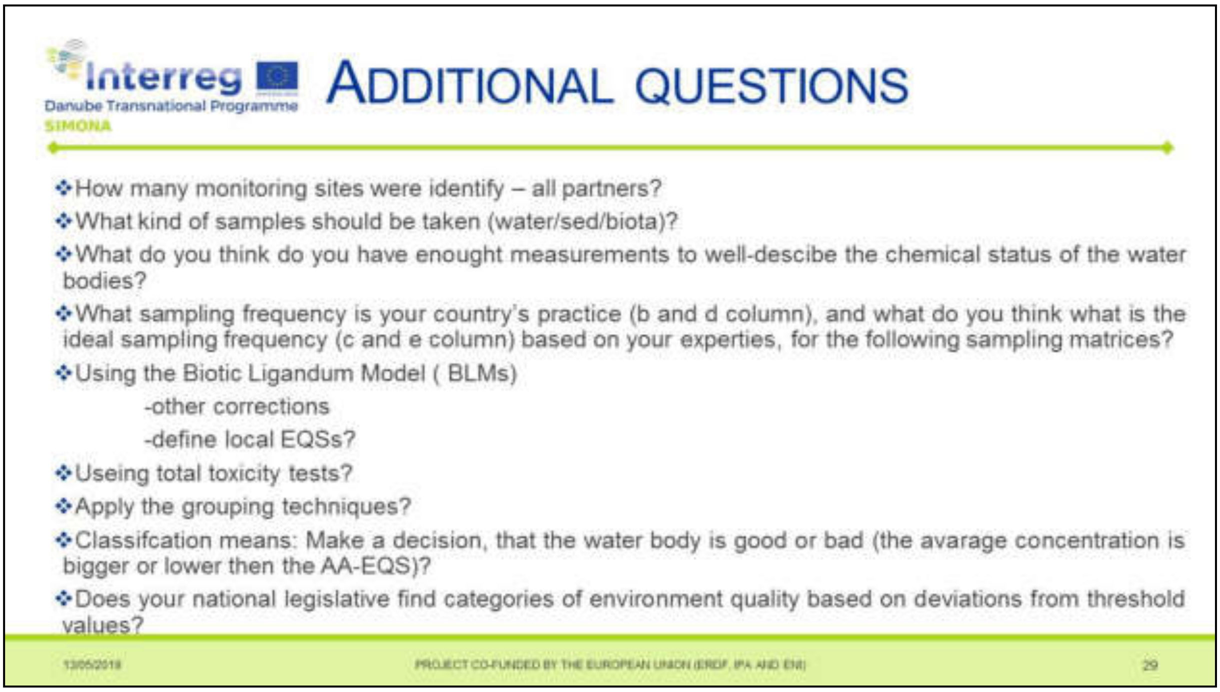

Interreg
Danube Transnational Programme
SIMONA
WFD Monitoring Programs
3) INVESTIGATE MONITORING PROGRAM
Investigative monitoring may be required in specified cases (Annex V.1.3.3). These are given as:
•where the **reason for any exceedance** (of environmental objectives) **is unknown**,
•where surveillance monitoring indicates that the objectives for a body of water are not likely to be achieved and **operational monitoring has not already been established**,
•in order to **ascertain the causes** of a water body or water bodies **failing** to achieve the environmental objectives,
•to **ascertain the magnitude and impacts of accidental pollution**.
13/05/2018
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
24


Interreg
Danube Transnational Programme
SIMONA
Sampling frequency for water
GENERALLY FOR WATER
According to WFD, Annex V 1.3.4:
•once-a-month for priority substances and
•once-per-three-months for other pollutants
will result in a certain confidence and precision.
Take samples in equidistant time intervals over a year, e.g., every four weeks resulting in 13 samples.
MORE FREQUENT SAMPLING
More frequent sampling may be necessary
•to detect long-term changes,
•to estimate pollution loads and
•to achieve acceptable levels of confidence and precision in assessing the status of water bodies.
Remember: Sediment sampling frequency will vary from once every 1 to 3 years for large rivers to once every 6 years for lakes.
13/05/2019
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
25


Interreg
Danube Transnational Programme
SIMONA
Sampling frequency
SEASONALLY VARIABLE SUBSTANCES
TO ACHIEVE ACCEPTABLE LEVELS OF CONFIDENCE AND PRECISION IN ASSESSING
E.G. SEASONAL PRESSURE FROM TOURISM, SEASONAL INDUSTRIAL ACTIVITIES, PESTICIDES
Seasonally variable substances can show peak concentrations within short time periods
-> enhanced sampling frequency may be necessary in these periods.
-> The results should be compared with the MAC-EQS (based on acute toxicity).
For example the best sampling time for detecting concentration peaks of pesticides
• due to inappropriate application is after heavy rainfall within or just after the application period.
• failure to comply with good agricultural practice, e.g., inappropriate cleaning of equipment during or at the end of the season before winter.
• Collecting composite samples (24h to one week) might be another option to detect peak concentrations of seasonally variable compounds.
13/05/2019
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
26


Interreg
Danube Transnational Programme
SIMONA
WFD Chemical Status Assessment
CONFIDENCE OF THE ANNUAL AVERAGE CONCENTRATIONS
Uncertainty depends on
1. the max LOQ of measurements
2. 'n': number of measured data
3. Ratio of the annual avarage and the EQS
2) Certainty class of n: $C_n = n/12 \cdot 5$
$C_{Total} = \frac{C_n + C_{LOQ} + C_R}{3}$
1) max LOQ
Certainty class of LOQ (C_{LOQ})
max LOQ ≤ 0.3 · EQS
5
0.3 · EQS < max LOQ ≤ 0.5 · EQS
3
0,5 · EQS < max LOQ ≤ EQS
1
EQS < max LOQ
Not useful data
3) R = Annual avarage/EQS
Certainty class of R (C_R)
R ≤ 0.5 · EQS
5
0.5 · EQS < R ≤ 0.8 · EQS
3
0,8 · EQS < R ≤ EQS
1
EQS < R
Failed
13/05/2019
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
27


Interreg
Danube Transnational Programme
SIMONA
ADDITIONAL SUPPORT
WFD DICTIONARY
13/05/2019
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
28


Interreg
Danube Transnational Programme
SIMONA
ADDITIONAL QUESTIONS
❖How many monitoring sites were identify – all partners?
❖What kind of samples should be taken (water/sed/biota)?
❖What do you think do you have enought measurements to well-descibe the chemical status of the water bodies?
❖What sampling frequency is your country's practice (b and d column), and what do you think what is the ideal sampling frequency (c and e column) based on your experties, for the following sampling matrices?
❖Using the Biotic Ligandum Model (BLMs)
-other corrections
-define local EQSs?
❖Useing total toxicity tests?
❖Apply the grouping techniques?
❖Classifcation means: Make a decision, that the water body is good or bad (the avarage concentration is bigger or lower then the AA-EQS)?
❖Does your national legislative find categories of environment quality based on deviations from threshold values?
13/05/2019
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
29


Interreg
Danube Transnational Programme
SIMONA
THANK YOU FOR ATTENTION!
13/05/2019
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
30

II.4. Sampling of stream bed sediments

This presentation is annexed (Annex 1) to this output at the following link and it is also in SIMONA web site Library:

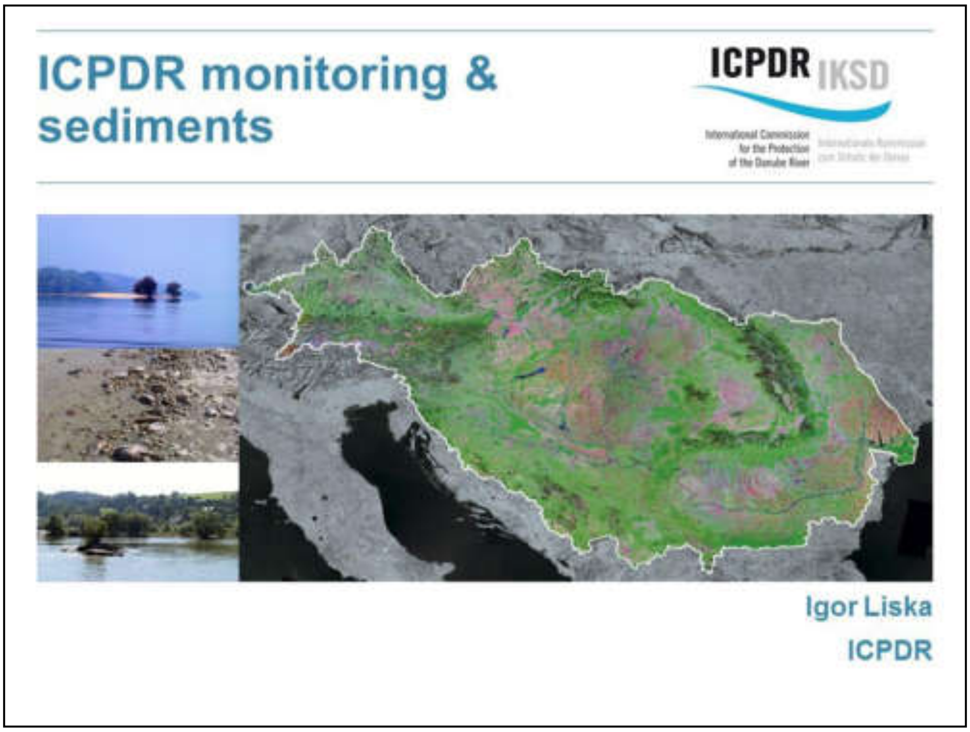
https://www.dropbox.com/s/p44km0fv257ht3j/T1.2_Annex1_Sampling%20of%20stream%20bed%20sediment.pdf?dl=0

II.5. Sediment sampling in large rivers

This presentation is annexed (Annex 2) to this output at the following link and it is also in SIMONA web site Library:

https://www.dropbox.com/s/i87dio682tnnfr9/T1.2_Annex2_Sediment%20sampling%20in%20large%20rivers.pdf?dl=0

II.6. ICPDR Monitoring



Water quality monitoring: Major drivers

ICPDR IKSD

International Commission for the Protection of the Danube River

- ⇨ DRPC (According to the Article 9 of the DRPC the Contracting Parties to DRPC have agreed to co-operate in the field of monitoring and assessment of the water resources)
- ⇨ EU WFD (establishing of WFD compliant monitoring networks by 22 December 2006)

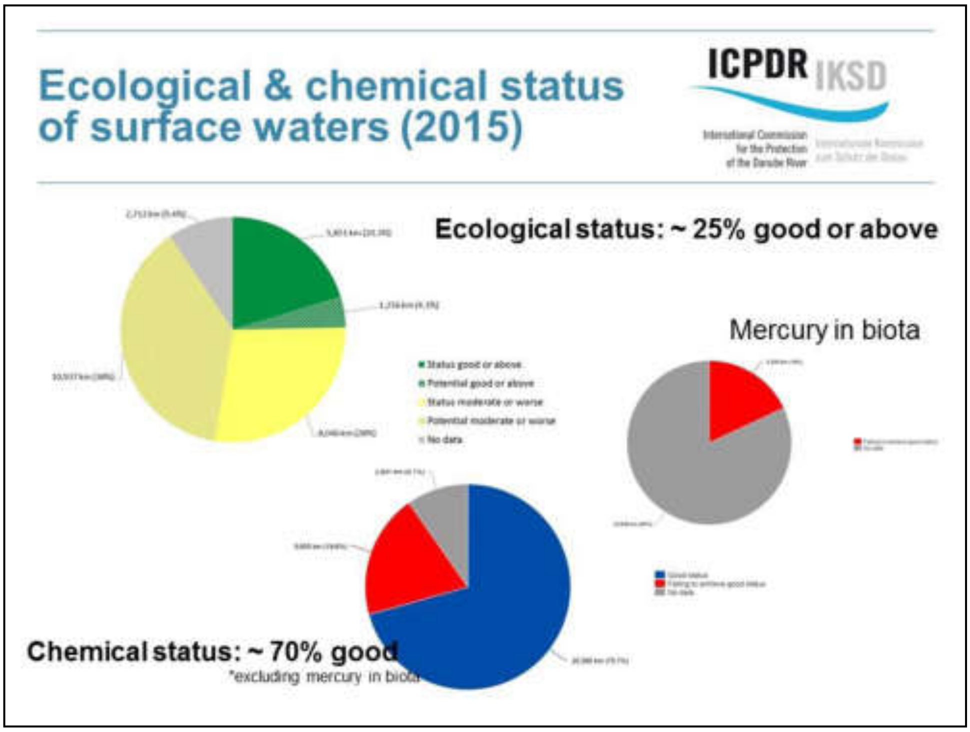
Trans National Monitoring Network – TNMN

ICPDR IKSD

International Commission for the Protection of the Danube River

TNMN

Monitoring activity	Data collection	Final product
Surveillance Monitoring 1	Aggregated data	Status assessment in DRBMP
Operational monitoring	Aggregated data	Status assessment in DRBMP
Surveillance Monitoring 2	Raw data	TNMN Yearbooks & reporting to BSC
Investigative monitoring	Raw data	Joint Danube Survey reports



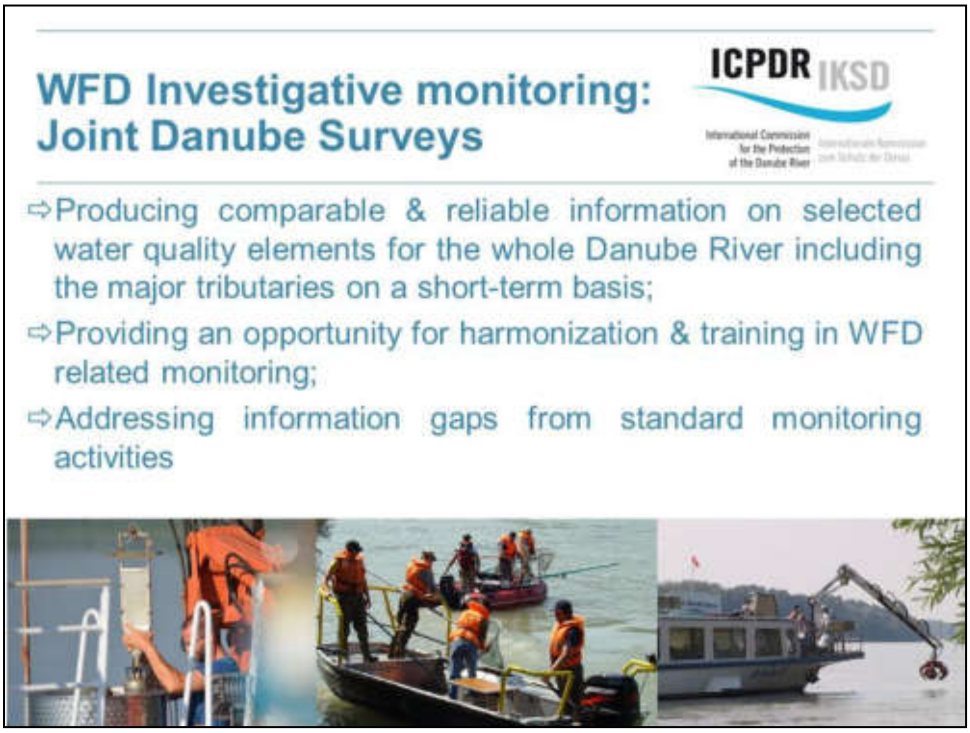
Quality element	Concentrations	Load assessment
Flow	anually / 12 x per year	daily
Temperature	anually / 12 x per year	
Transparency (1)	anually / 12 x per year	
Suspended Solids (5)	anually / 12 x per year	anually / 26 x per year
Dissolved Oxygen	anually / 12 x per year	
pH (5)	anually / 12 x per year	
Conductivity @ 20 °C (5)	anually / 12 x per year	
Alkalinity (5)	anually / 12 x per year	
Ammonium (NH_4^+-N) (5)	anually / 12 x per year	anually / 26 x per year
Nitrite (NO_2^--N)	anually / 12 x per year	anually / 26 x per year
Nitrate (NO_3^--N)	anually / 12 x per year	anually / 26 x per year
Organic Nitrogen	anually / 12 x per year	anually / 26 x per year
Total Nitrogen	anually / 12 x per year	anually / 26 x per year
Ortho-Phosphate (PO_4^{3-}-P) (2)	anually / 12 x per year	anually / 26 x per year
Total Phosphorus	anually / 12 x per year	anually / 26 x per year
Calcium (Ca^{2+}) (3, 4, 5)	anually / 12 x per year	
Magnesium (Mg^{2+}) (4, 5)	anually / 12 x per year	
Chloride (Cl^-)	anually / 12 x per year	
Atrazine	anually / 12 x per year	
Cadmium (6)	anually / 12 x per year	
Lindane (7)	anually / 12 x per year	
Lead (6)	anually / 12 x per year	
Mercury (6)	anually / 12 x per year	
Nickel (6)	anually / 12 x per year	
Arsenic (6)	anually / 12 x per year	
Copper (6)	anually / 12 x per year	
Chromium (6)	anually / 12 x per year	
Zinc (6)	anually / 12 x per year	
p,p'-DDT and its derivatives (7)	see below	
COD_{Cr} (5)	anually / 12 x per year	
COD_{Mn} (5)	anually / 12 x per year	
Dissolved Silica		anually / 26 x per year
BOD_5	anually / 12 x per year	

ICPDR IKSD
International Commission for the Protection of the Danube River

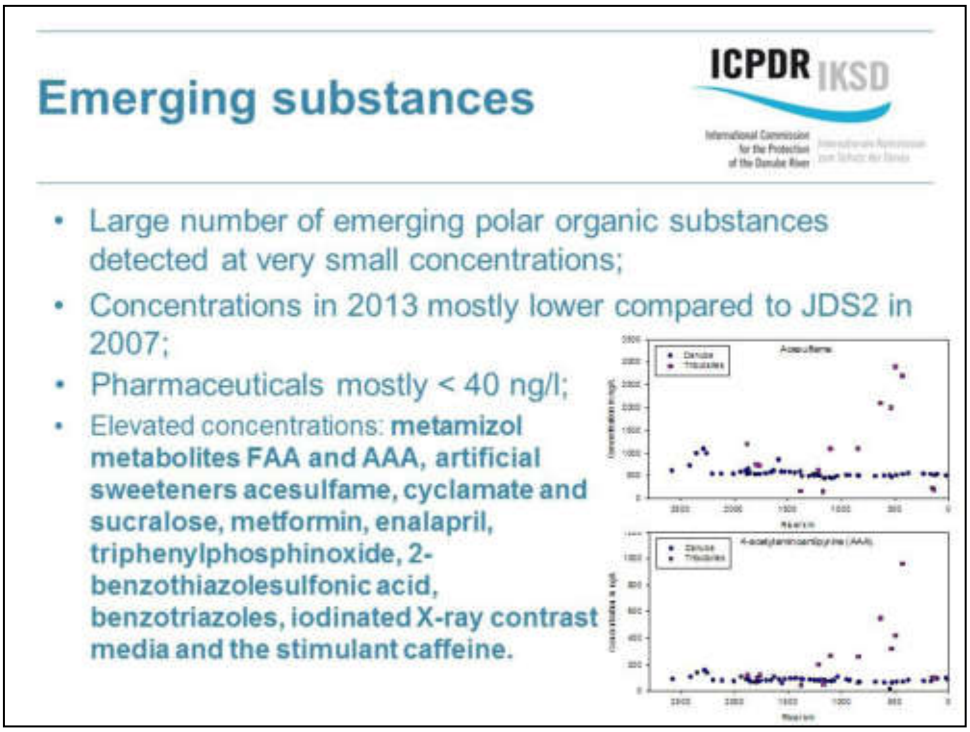
SM2 - Chemistry

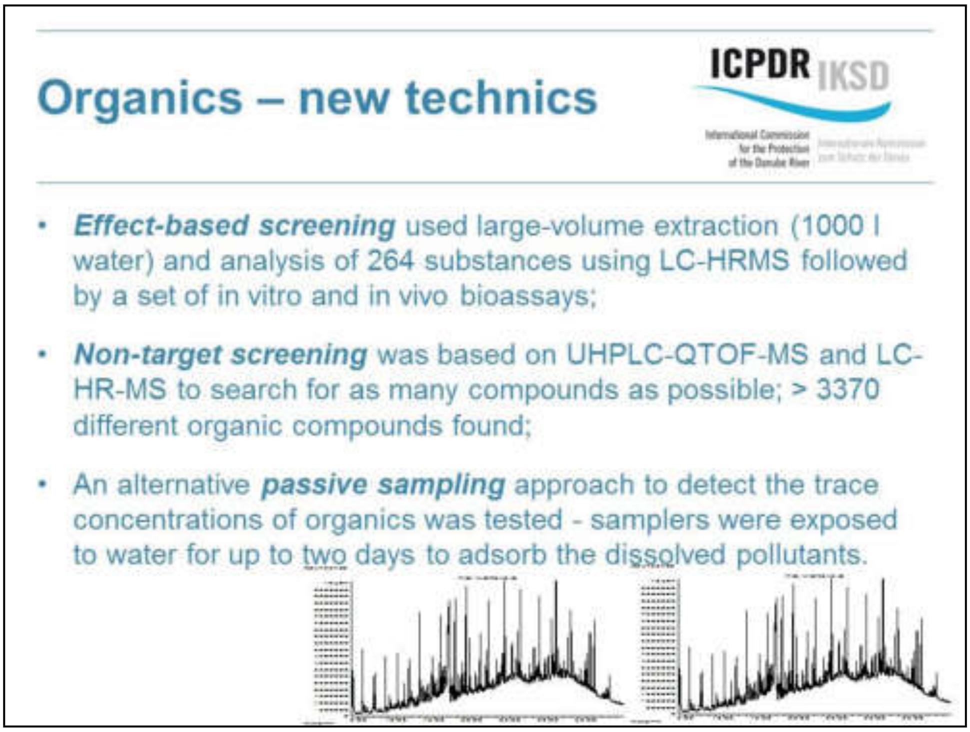
(1) Only in coastal waters
(2) Soluble reactive phosphorus SRP
(3) Mentioned in the tables of the CIS Guidance document but not in the related mind map
(4) Supporting parameter for hardness-dependent EQS of PS metals
(5) Not for coastal waters
(6) Measured in a dissolved form. Measurement of total concentration is optional
(7) In areas with no risk of failure to meet the environmental objectives for DDT and Lindane the monitoring frequency is 12 x per a RBMP period; in case of risk the frequency is 12 x year

>40 national labs!


WFD Investigative monitoring:
Joint Danube Surveys
ICPDR IKSD
⇨Producing comparable & reliable information on selected water quality elements for the whole Danube River including the major tributaries on a short-term basis;
⇨Providing an opportunity for harmonization & training in WFD related monitoring;
⇨Addressing information gaps from standard monitoring activities


ISTROS

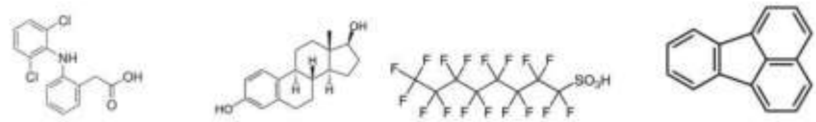

Emerging substances
ICPDR IKSD
International Commission for the Protection of the Danube River
• Large number of emerging polar organic substances detected at very small concentrations;
• Concentrations in 2013 mostly lower compared to JDS2 in 2007;
• Pharmaceuticals mostly < 40 ng/l;
• Elevated concentrations: metamizol metabolites FAA and AAA, artificial sweeteners acesulfame, cyclamate and sucralose, metformin, enalapril, triphenylphosphinoxide, 2-benzothiazolesulfonic acid, benzotriazoles, iodinated X-ray contrast media and the stimulant caffeine.
Acesulfame
Danube
Tributaries
4-acetylaminoantipyrine (AAA)


Organics – new technics
ICPDR IKSD
International Commission for the Protection of the Danube River
• Effect-based screening used large-volume extraction (1000 l water) and analysis of 264 substances using LC-HRMS followed by a set of in vitro and in vivo bioassays;
• Non-target screening was based on UHPLC-QTOF-MS and LC-HR-MS to search for as many compounds as possible; > 3370 different organic compounds found;
• An alternative passive sampling approach to detect the trace concentrations of organics was tested - samplers were exposed to water for up to two days to adsorb the dissolved pollutants.

RBSP prioritization

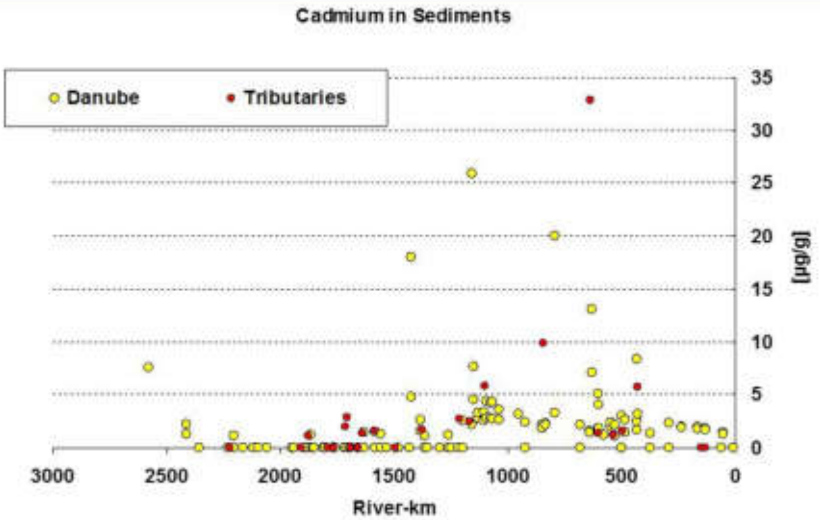
ICPDR IKSD

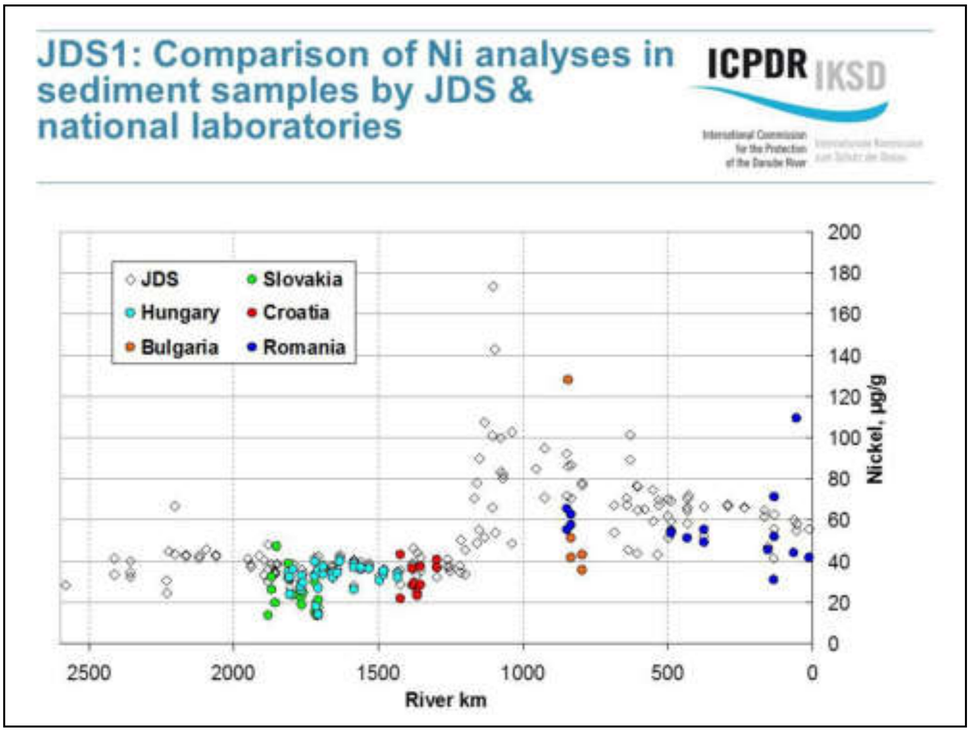
- Prioritization methodology developed by NORMAN network produced a list of **22** substances suggested as relevant for the DRB based on the results of the JDS3 target screening of **654** substances in the Danube water samples by 13 laboratories;
- PNEC values were available for **189** out of **277** JDS3 substances actually determined in the samples;
- The list contains five WFD priority substances (three PAHs, fluoranthene and PFOS) and two EU Watch List candidate compounds (17beta-estradiol, diclofenac).

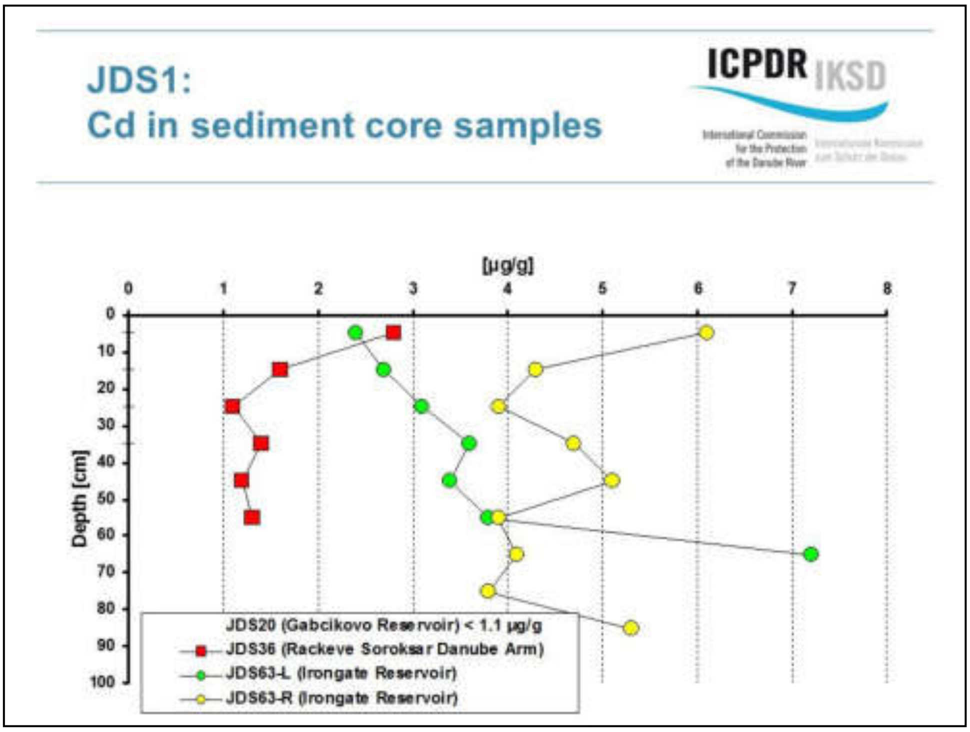


JDS1

ICPDR IKSD




JDS1: Comparison of Ni analyses in sediment samples by JDS & national laboratories
ICPDR IKSD
JDS
Slovakia
Hungary
Croatia
Bulgaria
Romania
Nickel, µg/g
River km


JDS1:
Cd in sediment core samples
ICPDR IKSD
[µg/g]
Depth [cm]
JDS20 (Gabcikovo Reservoir) < 1.1 µg/g
JDS36 (Rackeve Soroksar Danube Arm)
JDS63-L (Irongate Reservoir)
JDS63-R (Irongate Reservoir)

JDS1: Significant changes in the element concentrations between layers of the sediment cores

ICPDR IKSD

International Commission for the Protection of the Danube River

(concentration difference > uncertainty of the analytical procedure)

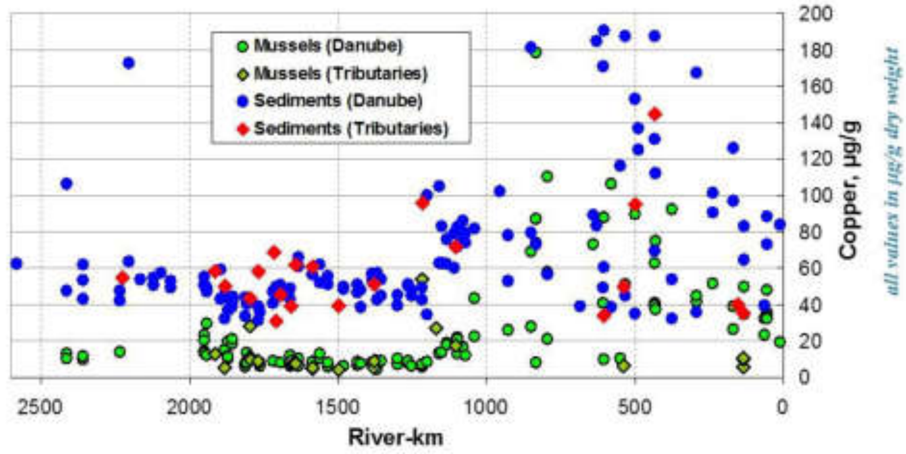
Element	As	Cr	Hg	Pb	Cu	Ni	Cd	Zn	Fe	Mn	Al
Uncertainty of Analytical Method [%]	15	11	14	14	7	8	11	10	11	10	15
Gabcikovo Reservoir (JDS20)	≈	≈	⇧	≈	≈	≈	≈	≈	≈	≈	≈
Rackeve-Soroksar Danube (JDS36)	≈	≈	⇧	≈	⇧	≈	⇧	≈	≈	≈	≈
Irongate Reservoir (JDS63-L)	⇩	⇩	⇩	⇩	≈	⇩	⇩	⇩	≈	≈	≈
Irongate Reservoir (JDS63-R)	⇩	⇩	⇩	⇩	≈	⇩	≈	⇩	≈	≈	≈

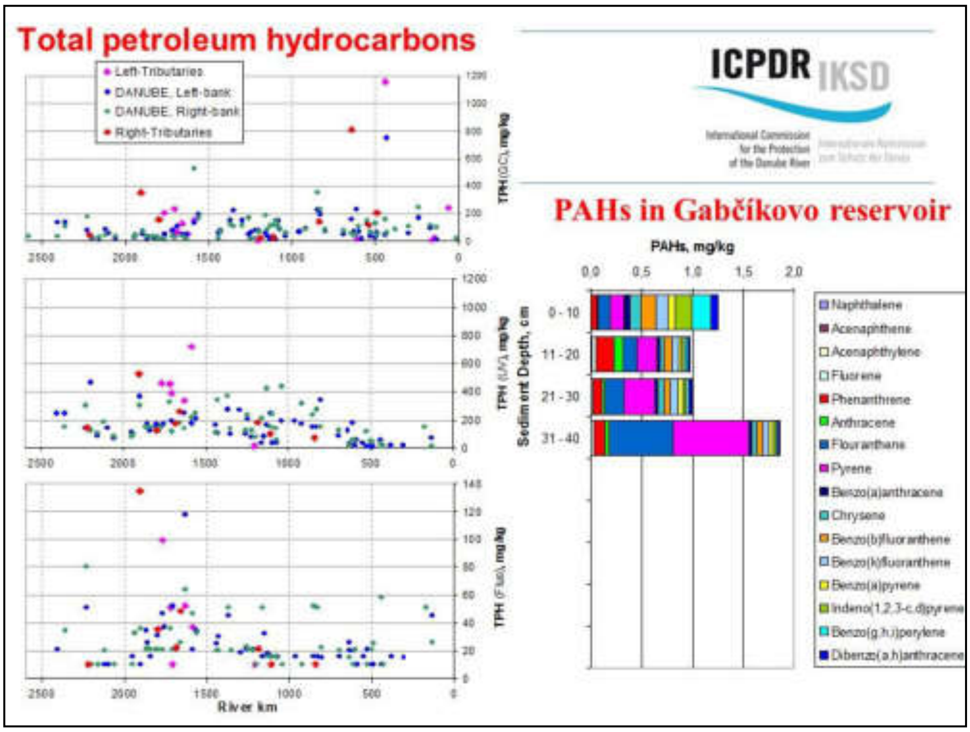
("⇩" - decreasing temporal trend, "⇧" - increasing temporal trend, "≈" – no significant change)

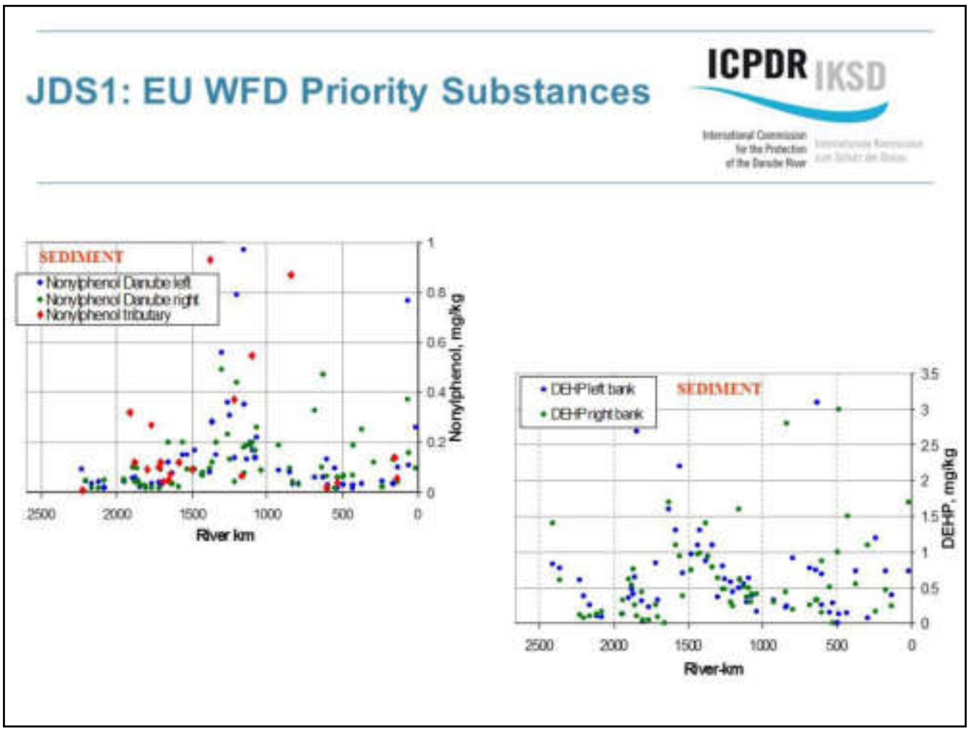
JDS1: Cu in sediment and mussel samples along the Danube and its tributaries

ICPDR IKSD

International Commission for the Protection of the Danube River




Total petroleum hydrocarbons
Left-Tributaries
DANUBE, Left-bank
DANUBE, Right-bank
Right-Tributaries
River km
ICPDR IKSD
PAHs in Gabčíkovo reservoir
PAHs, mg/kg
Sediment Depth, cm
0 - 10
11 - 20
21 - 30
31 - 40
Naphthalene
Acenaphthene
Acenaphthylene
Fluorene
Phenanthrene
Anthracene
Flouranthene
Pyrene
Benzo(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Indeno(1,2,3-c,d)pyrene
Benzo(g,h,i)perylene
Dibenzo(a,h)anthracene


JDS1: EU WFD Priority Substances
ICPDR IKSD
International Commission for the Protection of the Danube River
SEDIMENT
Nonylphenol Danube left
Nonylphenol Danube right
Nonylphenol tributary
Nonylphenol, mg/kg
River km
DEHP left bank
DEHP right bank
SEDIMENT
DEHP, mg/kg
River-km

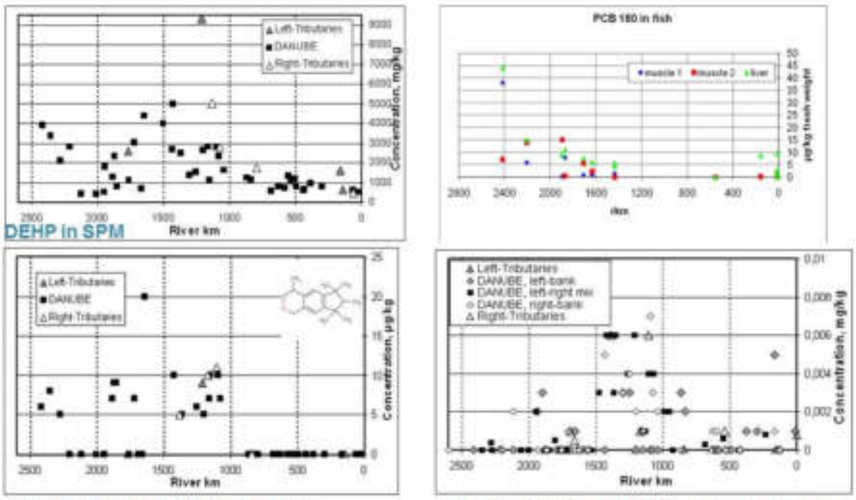
JDS2
Sediments & SPM

Joint Danube Survey 2

- The results for organochlorine compounds do not indicate that these substances are relevant pollutants in the Danube, which is an improvement of the past situation as described in the Danube Roof Report 2004.
- PAH values in sediments were about one order of magnitude lower than those typically found in the Elbe.
- Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs) and dioxin-like PCBs were more than one order of magnitude lower when compared to the Elbe and only one site slightly exceeded the "safe sediment value" for PCDD/Fs. EC-6 PCBs did not exceed the German quality standards in sediment.
- The results of the ecotoxicological analysis of the Danube sediments showed no significant toxic effects.

JDS2
Sediments & SPM & biota

Joint Danube Survey 2



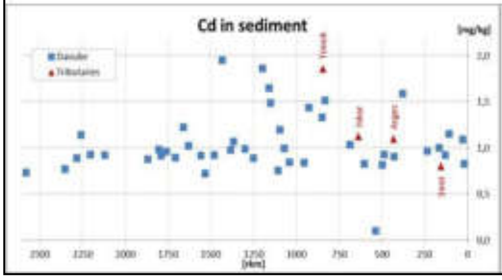
DEHP in SPM

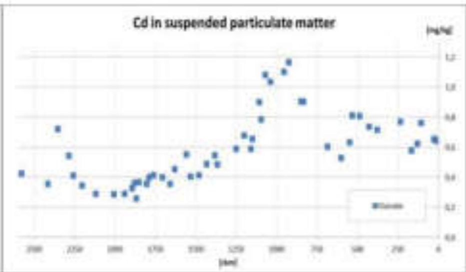
HHCB (Galaxolide) in in SPM

Decabromodiphenylether in sediments

JDS3: Metals

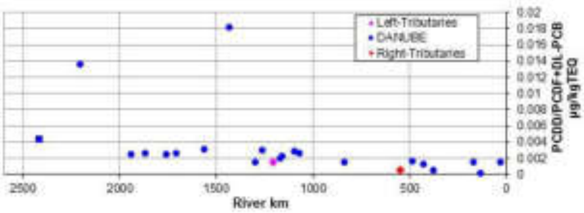
- Contents of metals in water, SPM and bottom sediments were similar to those observed during JDS1 and JDS2;
- In sediment the DE targets for metals were with one exception (Cu at JDS48) met at all sites for all elements;
- Concentrations of Hg in all analyzed fish samples exceeded the EQS significantly.





JDS3: Organics in sediment

- Concentrations for PAH in SPM and sediments were comparable to JDS2 results;
- For PCDD/F and PCBs none of the existing EQS values for aquatic biota and SPM/sediments, and none of the EU food limits concerned were exceeded.



Dioxins and dioxin-like compounds in sediment

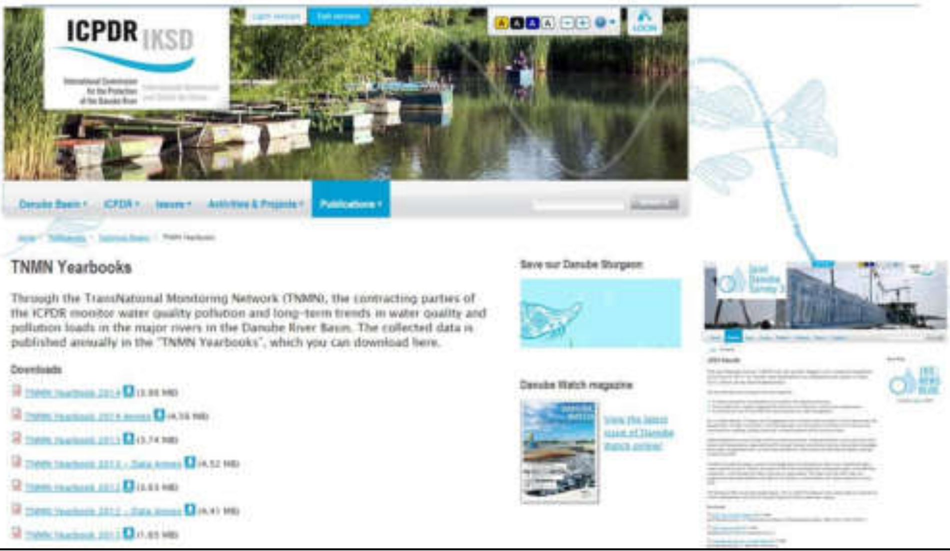
JDS4 sediments

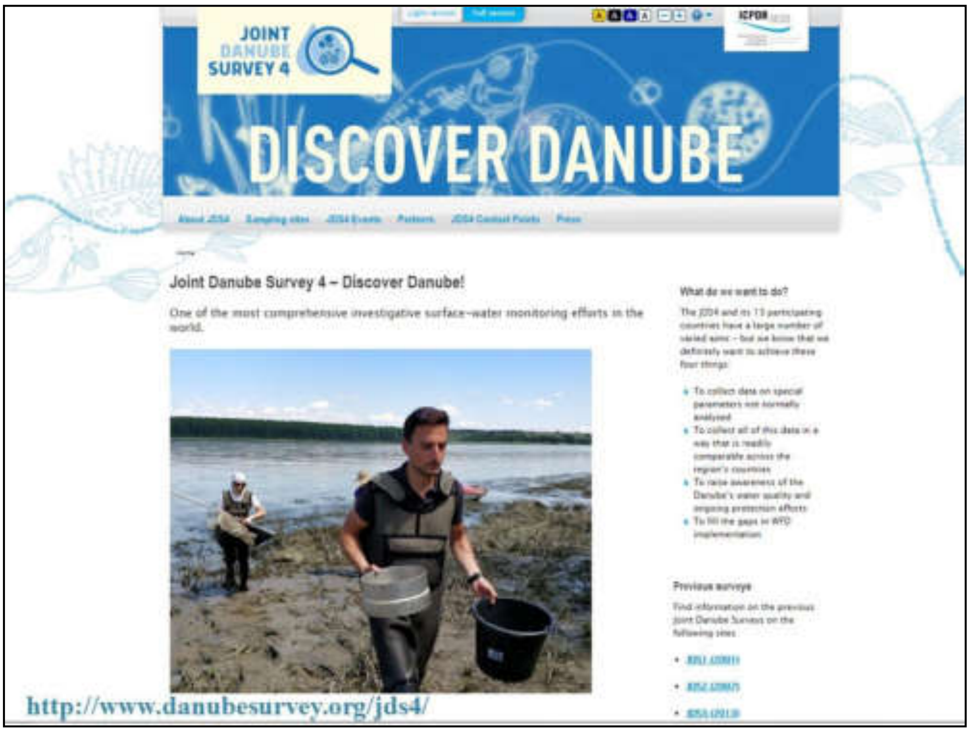
ICPDR IKSD

- Sediment data from JDS1-JDS3 are available;
- **Directive 2013/39/EU again is not setting EQS for sediments;**
- Sediment analysis for trend monitoring requires more than one sampling per year and should take place every three years, thus results from JDS1 – JDS4 would not be a reliable base for trend monitoring. On the other hand there are national data available e.g. for metals and PAH;
- JDS4: No target analysis of sediments;
- Wide-scope target and suspect (DSFP) screening of sediment by LC-HR-MS and GC-HR-EI-MS (UFZ) and LC-HR-MS and GC-HR-APCI-MS (UoA/EI).

Publishing

ICPDR IKSD





II.7. SIMONA Sampling Work Group

This presentation is annexed (Annex 3) to this output at the following link and it is also in SIMONA web site Library:

https://www.dropbox.com/s/e9isuvzyzy7y38j/T1.2_Annex3_SIMONA_WG_Sampling_WP4.pdf?dl=0

II.8. SIMONA Sediment Sampling Protocols

This presentation is annexed (Annex 4) to this output at the following link and it is also in SIMONA web site Library:

https://www.dropbox.com/s/cud6ekn1lhcy2o5/T1.2_Annex4_SIMONA%20Sediment%20sampling%20protocols.pdf?dl=0

II.9. SIMONA Laboratory WG - Harmonization of analytical methods

This presentation is annexed (Annex 5) to this output at the following link and it is also in SIMONA web site Library:

https://www.dropbox.com/s/lrwzy7wo1sw9mh4/T1.2_Annex5_Harmonisation%20of%20analytical%20methods.pdf?dl=0

III. WORKSHOP MINUTES

The Inventory workshop was an open event to all stakeholders and beneficiaries of the SIMONA project. In the first part, the partners were invited to give presentations on (best) methods. While the second part was devoted to review the current status of activity WP 4.1 Reviewing current sampling and laboratory methods of HSs in water, sediment and biota matrixes. This presentation was followed by two presentations of the working groups Sampling and Laboratory.

At the open discussion the challenge of harmonizing with existing project DanubeSediment emerged. The DanubeSediment will set up monitoring network with several extra monitoring points with the purpose to evaluate sediment balance. This network will serve as a baseline for SIMONA project, whose aim is mainly the evaluation of the quality of sediments. Regarding the harmonized procedures within the SIMONA project, the guidelines or rules given from the European Commission are not satisfactory. SIMONA project will provide joint monitoring exercises, respecting in the same time the national legislations.

Through the discussions, the partnership decided to start the harmonization at the starting point – inventorying and reviewing the existing ISO standards and guidelines. Some partners are not familiar with the international standards, so the mutual decision was made that partners will review and study the existing literature (there is budgetary line for this).

Based on the project results the main points and recommendations in relation to sediment monitoring were pointed out:

- The sampling and laboratory analysis protocols for sediment monitoring should be developed on the legal basis of the WFD and the knowledge base of the projects: FOREGS, GEMAS and DanubeSediment taking in account the current status in the WFD countries according to the questionnaires.
- Most of DTB countries face serious challenges of the implementation of the HSs concentrations monitoring in the surface water sediments required by the WFD, therefore the harmonized international sediment quality monitoring protocols and procedures it is essential to be developed. The chemical analysis of HSs in sediment should be performed in accredited laboratory.
- The challenge of harmonization SIMONA with DanubeSediment project, which is in a more advance state, emerged.

Additional recommendations from the Inventory workshop will be given in a SIMONA project report as well as in sampling and laboratory protocols.

Working groups (WG) were established at the Kick-off meeting in September 2018 in Ljubljana. Due to some changes in the project teams within partnership, the WGs were also finalized during Vienna meeting. The challenge of the working groups is to clearly define appropriate procedures for monitoring stream sediments. For the field work, common field sheets should be designed.

3. COUNTRIES FEEDBACK

AUSTRIA

Interreg Danube Transnational Programme SIMONA

Legislative framework in Austria

No	Title (in national language)	Title (in English)	Link	Country
1	Wasser-rahmenrichtlinie	Water Framework Directive	https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013L0039&from=EN	EU
2	Grundwasser-richtlinie	Groundwater Directive	https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006L0118&rid=8	EU
3	Wasserrechts-gesetz	Water Rights Act	https://www.bmnt.gv.at/dam/jcr:5614b40b-dc4b-4c2c-a03d-3676537b7d4e/WRG%201959%20zgd%20BGBl.%20I%20Nr%2061/2018.pdf	AT
4	Qualitätsziel-verordnung Chemie Grundwasser + Oberflächen-gewässer + Ökologie Oberflächen-gewässer	Quality Ordinance for the Chemistry of Groundwater and the Chemistry and Ecology of Surface Water	https://www.ris.bka.gv.at/Dokumente/BgblAuth/BGBLA_2016_II_363/BGBLA_2016_II_363.pdfsig	AT

Project co-funded by the European Union

Vienna Meeting, 10.-11. April, 2019

Interreg Danube Transnational Programme SIMONA

Legislative framework in Austria

No	Title (in national language)	Title (in English)	Link	Country
5	Trinkwasser-verordnung	Quality Ordinance for Drinking water	https://www.ris.bka.gv.at/Dokumente/BgblAuth/BGBLA_2017_II_362/BGBLA_2017_II_362.pdfsig	AT
6	Abwasser-emissions-verordnung	Ordinance for Emission of Sewage water	https://www.ris.bka.gv.at/GeltendeFassung/Bundesnormen/10010977/AAEV%2c%20Fassung%20vom%2005.11.2018.pdf	AT
7	Immissions-schutzgesetz – Luft	Air Pollution Control Act	http://www.ris.bka.gv.at/GeltendeFassung/Bundesnormen/10011027/IG-L%2c%20Fassung%20vom%2008.11.2018.pdf	AT
8	Gewässer-zustands-überwachungs-verordnung		https://www.ris.bka.gv.at/Dokumente/BgblAuth/BGBLA_2006_II_479/BGBLA_2006_II_479.pdfsig	AT
9	Industrie-emissons-Richtlinie		https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010L0075&from=EN	EU

Project co-funded by the European Union

Vienna Meeting, 10.-11. April, 2019

Interreg Danube Transnational Programme SIMONA

Sampling by institutions

- Geological Survey of Austria
  - Stream bed and floodplain sediments (project-related)
- AIT Austrian Institute of Technology
  - Thermal/mineral water (customer or research projects)
- Federal Environment Agency
  - National chemical monitoring of water (groundwater, surface water bodies); special monitoring in special projects, e.g. for pesticides
  - Sediment sampling (bottom, suspended) only in framework of projects

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

Vienna Meeting, 10.-11. April, 2019

Interreg Danube Transnational Programme SIMONA

Finalized/ongoing projects related to geochemistry of water, soils and sediments

No.	Project title (national language, if available)	Project Title (EN)	Year	Country	Project coordinators, Partners
1	Geochemischer Atlas von Österreich	Geochemical Atlas of Austria	2015	AT	Pirkl, H., Schedl, A. & Pfleiderer, S.
2	Hydrochemie und Hydrogeologie der österreichischen Grundwässer und deren natürliche Metall- und Nährstoffgehalte (Update GeoHint 2018)	Hydrochemistry and hydrogeology of Austrian groundwaters and their natural metal and nutrient content	2018	AT	Philippitsch, R. & Humer, F.
3	Referenzwerte für Schwermetalle in Oberböden	Guideline values for heavy metals in top soils	2004	AT	Schwarz, S. & Freudenschuss, A.
4	EUWI+East	European Water Initiative for Eastern Partnership	2020	EU	

1 – finalized national project on stream sediment quality

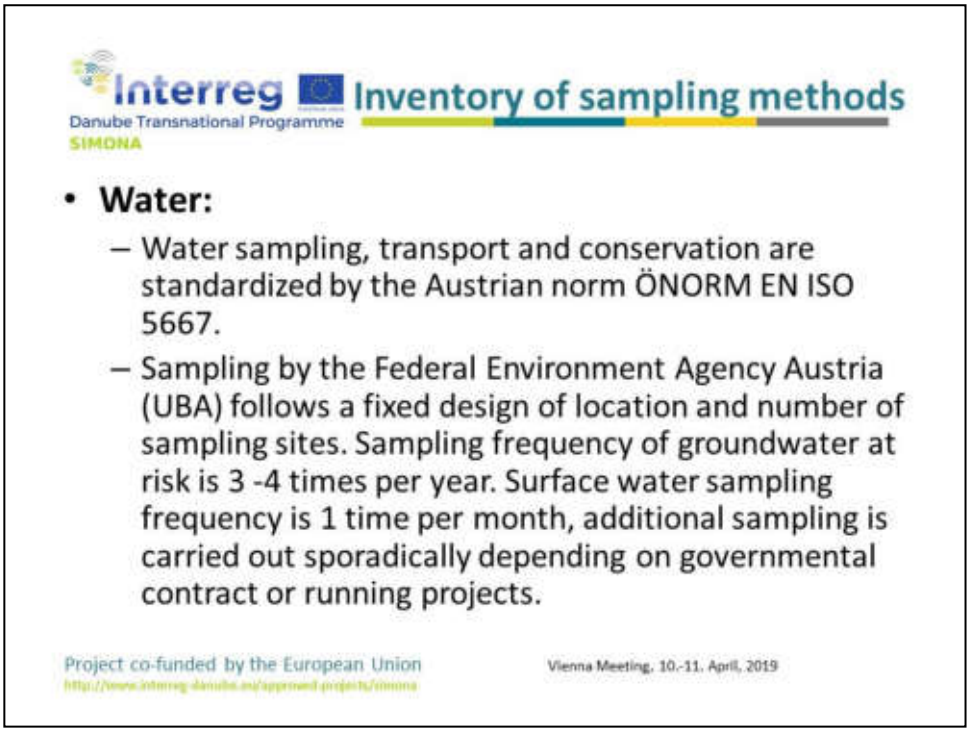
2 – finalized national project on groundwater quality

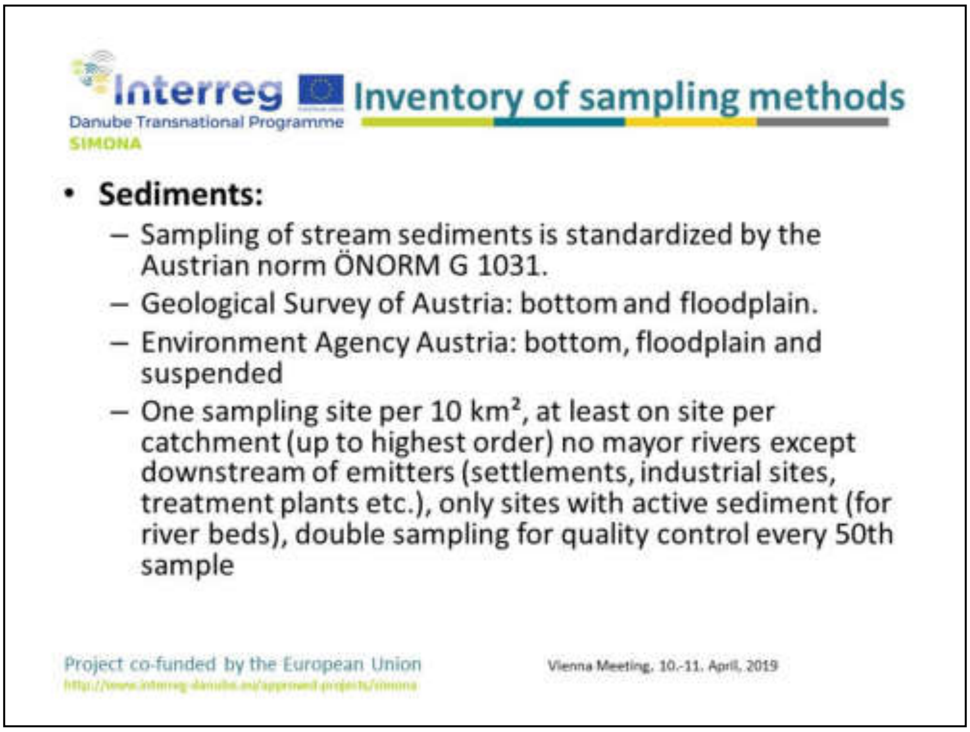
3 – finalized national project on soil quality

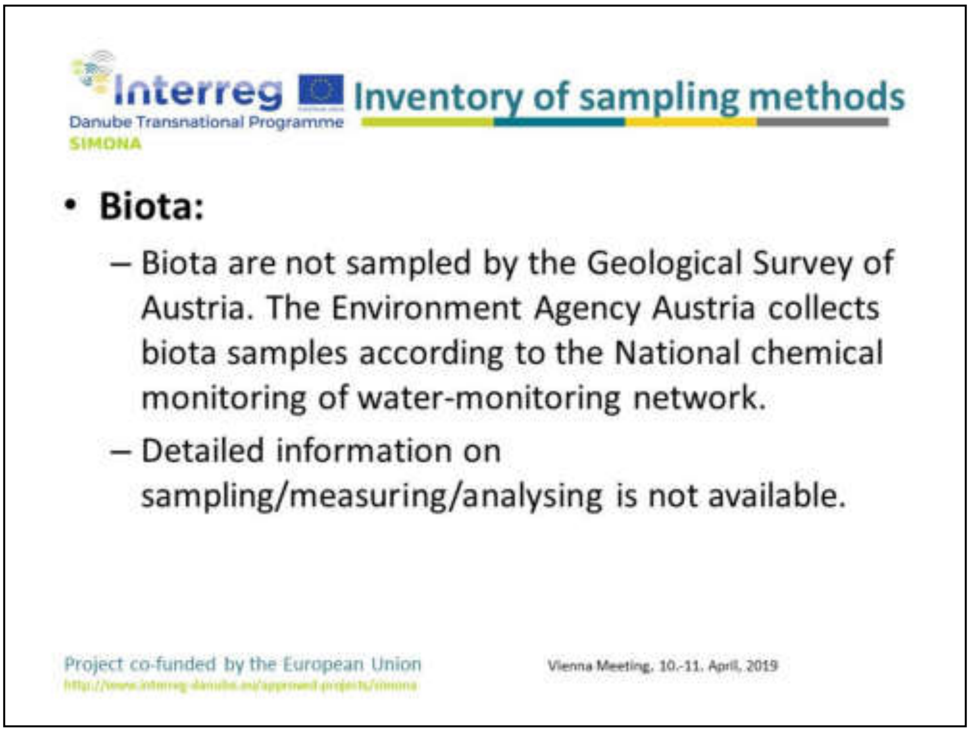
4 – ongoing EU project for sustainable management of water resources

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

Vienna Meeting, 10.-11. April, 2019


Interreg
Danube Transnational Programme
SIMONA
Inventory of sampling methods
• Water:
– Water sampling, transport and conservation are standardized by the Austrian norm ÖNORM EN ISO 5667.
– Sampling by the Federal Environment Agency Austria (UBA) follows a fixed design of location and number of sampling sites. Sampling frequency of groundwater at risk is 3 -4 times per year. Surface water sampling frequency is 1 time per month, additional sampling is carried out sporadically depending on governmental contract or running projects.
Project co-funded by the European Union
Vienna Meeting, 10.-11. April, 2019


Interreg
Danube Transnational Programme
SIMONA
Inventory of sampling methods
• Sediments:
– Sampling of stream sediments is standardized by the Austrian norm ÖNORM G 1031.
– Geological Survey of Austria: bottom and floodplain.
– Environment Agency Austria: bottom, floodplain and suspended
– One sampling site per 10 km², at least on site per catchment (up to highest order) no mayor rivers except downstream of emitters (settlements, industrial sites, treatment plants etc.), only sites with active sediment (for river beds), double sampling for quality control every 50th sample
Project co-funded by the European Union
Vienna Meeting, 10.-11. April, 2019



BOSNIA and HERZEGOVINA (Republic of Srpska)

Interreg
Danube Transnational Programme
SIMONA

QUESTIONNAIRE FOR EXISTING SAMPLING, LABORATORY AND EVALUATION METHODS

I.1 Enumeration of entity's or European legislation (laws, governmental orders, emergency ordinances) that regulates the concentrations of dangerous substances posing a risk to the health of the population or aquatic life and surface waters, in soils, **drinking water** river sediments, marine sediments, sewage, therapeutic sludge, air and biota.

No	Title (in national language)	Title (in English)	Link
1	Zakon o vodama (Službeni glasnik Republike Srpske broj 50/06, 92/09,121/12, 74/17)	Law on water (Official Gazette of Republic of Srpska 50/06, 92/09,121/1, 74/17)	http://www.voders.org/images/PDF/zakoni/zakon_o_vodama_precisceni.pdf
2	Zakon o zaštiti vazduha (Službeni glasnik Republike Srpske broj 124/11, 46/17)	Law on air (Official Gazette of Republic of Srpska 124/11, 46/17)	http://www.narodnaskupstinars.net/?q=la/akti/usvojeni-zakoni
3	Zakon o zaštiti životne sredine (Službeni glasnik Republike Srpske broj 71/12, 79/15)	Law on environment (Official Gazette of Republic of Srpska 71/12, 79/15)	http://www.narodnaskupstinars.net/?q=la/akti/usvojeni-zakoni
4	Uredba o klasifikaciji voda i kategorizaciji vodotoka (Službeni glasnik Republike Srpske broj 41/01)	Regulation on water classification and categorization of water courses (Official Gazette of Republika Srpska 41/01)	http://www.voders.org/propisi-i-obrasci/pravna-regulativa/
5	(Službeni glasnik Republike Srpske broj 44/01)	Rulebook on conditions for discharging wastewater into surface waters ("Official Gazette of RS", No. 44/01)	http://www.voders.org/images/propisi-i-obrasci/pravna-regulativa/
6	Pravilnik o uslovima za ispuštanje otpadnih voda u javnu kanalizaciju (Službeni glasnik Republike Srpske broj 44/01)	Regulations on the terms of release wastewater into the public sewerage system ("Official Gazette of RS", No. 44/01)	http://www.voders.org/propisi-i-obrasci/pravna-regulativa/
7	Pravilnik o tretmanu i odvodnji otpadnih voda za područje gradova i naselja gdje nema javne kanalizacije (Službeni glasnik Republike Srpske broj 68/01)	Rulebook on treatment and waste water disposal in the cities and towns where there is no public sewage system ("Official Gazette of RS", 68/01)	http://www.voders.org/propisi-i-obrasci/pravna-regulativa/
8	Pravilnik o zdravstvenoj ispravnosti vode namijenjene za ljudsku potrošnju (Službeni glasnik Republike Srpske, broj 88/17)	Ordinance on drinking water health quality for human use („Official Gazette Republika Srpska", no 88/17),	http://www.ministarstvo-zdravlja@mzsz.vladars.net

Project co-funded by the European Union
Inventory Workshop, 10th – 11th April 2019, Wien
http://www.interreg-danube.eu/approved-projects/simona

Interreg
Danube Transnational Programme
SIMONA

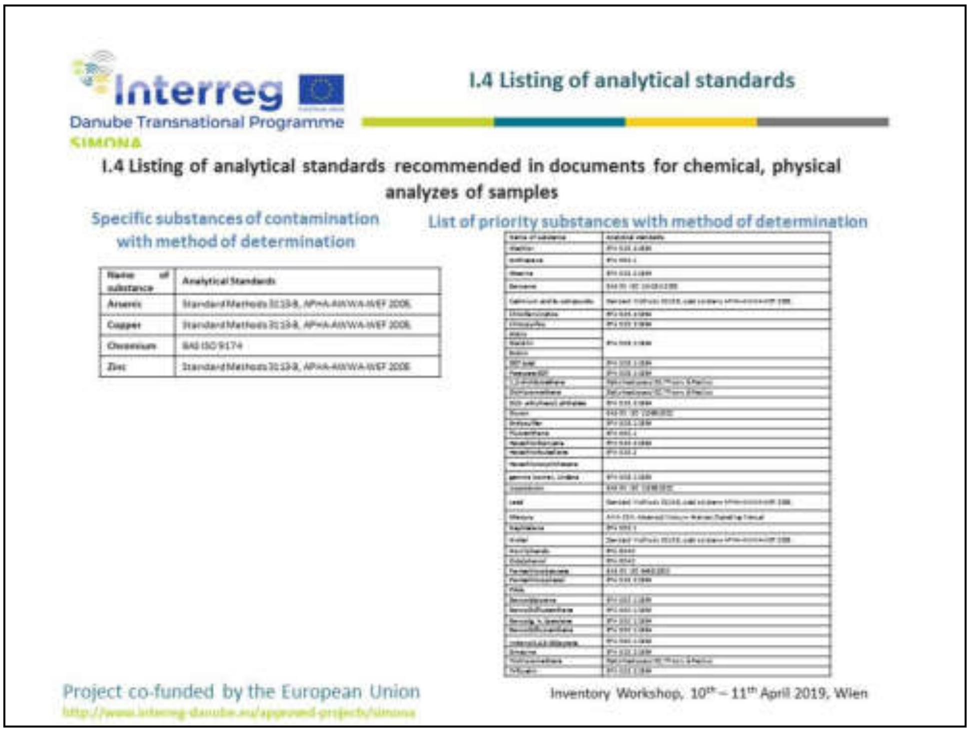
I.2 List of dangerous (hazardous) substances

I.2 List of dangerous (hazardous) substances (metals, non-metals, PAHs, PCBs) concentration levels, their significance in waters, solids or biota, **in accordance with the national legislative framework**

Standard quality concentrations for surface water in Republika Srpska (from Directive 2008/105/EC)

Name of substance	Annual average for inland surface waters EQS (μg/L)	Name of substance	Annual average for inland surface waters EQS (μg/L)
Alachlor	0.3	Hexachlorbenzene	0.01
Anthracene	0.1	Hexachlorbutadiene	0.1
Atrazine	0.6	Hexachlorocyclohexane	0.02
Benzene	10	gamma isomer, Lindane	
Cadmium and its compounds	≤ 0.08 (category 1)	Isoproturon	0.3
	0.08 (category 2)	Lead	7.2
	0.09 (category 3)	Mercury	0.05
	0.15 (category 4)	Naphtalene	2.4
	0.25 (category 5)	Nickel	20
Chlorfenvinphos	0.1	Nonilphenols	0.3
Chlorpyrifos	0.03	Octylphenol	0.1
Aldrin	∑=0.005	Pentachlorobenzene	0.07
Dieldrin		Pentachlorophenol	0.4
Endrin		PAHs	
DDT total	0.025	Benzo(a)pyrene	0.05
Para-para-DDT	0.01	Benzo(b)fluoranthene	∑0.03
1,2-dichloroethane	10	Benzo(g, h, i)perylene	∑0.002
Dichloromethane	20	Benzo(k)fluoranthene	∑0.03
Di(2- ethylhexyl) phthalate	1.3	Indeno(1,2,3-CD)pyrene	∑0.002
Diuron	0.2	Simazine	1
Endosulfan	0.005	Trichloromethane	2.5
Fluoranthene	0.1	Trifluralin	0.03

Project co-funded by the European Union
Inventory Workshop, 10th – 11th April 2019, Wien
http://www.interreg-danube.eu/approved-projects/simona



Name of substance	Analytical Standards
Arsenic	Standard Methods 3113-B, APHA-AWWA-WEF 2005
Copper	Standard Methods 3113-B, APHA-AWWA-WEF 2005
Chromium	BAS ISO 9174
Zinc	Standard Methods 3113-B, APHA-AWWA-WEF 2005

Element	Analytical standards
Water temperature	Standard Methods 2550 B, published from: APHA-AWWA-WEF, 2005
Suspended mater	BAS ISO 11923:2002
Dissolved oxygen	BAS EN 25814:2000
pH of water	BAS ISO 10523:2002
Conductivity	BAS EN 27888:2002
BOD5	BAS EN 1899-1:2002
BOD5	BAS EN 1899-2:2002
COD	Standard Methods 5220 D, published by APHA-AWWA-WEF, 2005
Determination of alkalinity	BAS EN ISO 9963-1:2000
Determination of Ca and Mg sum	BAS ISO 6059:2000
Determination of ammonium ion	BAS ISO 7150-1:2002
Determination of nitrate	BAS EN ISO 10304-1:2010
Determination of nitrite	BAS EN 26777:2002
Determination of Kjeldahl nitrogen	BAS EN 25663:2000
Total nitrogen	calculating
Determination of chlorine	BAS EN ISO 10304-1:2010
Determination of phosphorus	BAS ISO 6878:2002
Determination of orthophosphate	BAS ISO 6878:2002
Determination of dissolved phosphorus	BAS ISO 6878:2002
Determination of calcium	Standard methods 3500 (B), published by APHA-AWWA-WEF 2005
Determination of magnesium	Calculation
Determination of % oxygen saturation	Electrochemical
Determination of chemical oxygen demand (permanganate)	Standard methods for chemical safety testing, SZZZ Belgrade 1990

Interreg
Danube Transnational Programme
SIMONA

II PRACTICES, EXPERIENCES

I.6 List of national and international guides of techniques on the design of sampling, transport, storage, samples preparation recommended in documents

	Sediment	Water
Sampling design, sampling, transport, storage	-	BAS EN 5667-1:2008 BAS ISO 5667-3:2005 BAS ISO 5667-6:2000

II.2. Significant papers, books, related to geochemistry of waters, soils, sediments in the Danube basin

Paper title	Title	Year	Country	Authors
	CONSIDERATIONS ON RESERVOIR SEDIMENTATION AND HEAVY METALS CONTENT WITHIN THE DRENOVA RESERVOIR (B&H)	2013	B&H Republika Srpska	Radislav TOŠIĆ, Slavoljub DRAGIĆEVIĆ, Snežana BELANOVIĆ, Ilija BRČESKI & Novica LOVRIĆ

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

Inventory Workshop, 10th – 11th April 2019, Wien

Interreg
Danube Transnational Programme

II PRACTICES, EXPERIENCES

II.3 Existent waterbodies and sampling sites and current quality monitoring stations of the Danube River Basin

Danube River Basin Monitoring Stations in Republika Srpska

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

Inventory Workshop, 10th – 11th April 2019, Wien

Interreg
Danube Transnational Programme
SIMONA

III.INVENTORY OF SAMPLING METHODOLOGIES

III.1. Water

III.1.2. **Parameters of water quality/quantity measured *in situ***

Temperature, dissolved oxygen, pH and electroconductivity.

III.1.3. **Instruments used for *in situ* measurements**

WTW

III.1.4. **Methodology for *in situ* measurements**

Temperature- Standard Methods 2550 APHA-AWWA-WEF, 2005
Dissolved oxygen- EN ISO 25814:2014
pH- BAS ISO 10523:2013
Electroconductivity- EN 27888:2002.

III.1.5. **Tools used for collecting samples for laboratory measurements**

III.1.6. **Sample preservation**

III.1.7. **Methodology for collecting samples and further procedures**

ISO 5667

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

Inventory Workshop, 10th – 11th April 2019, Wien

Interreg
Danube Transnational Programme
SIMONA

III.INVENTORY OF SAMPLING METHODOLOGIES

IV.3 Inventory of national laboratories

Analytical control of all parameters according to ISO 17 025.
Laboratory checked according to EN ISO/IEC 17043.

V.1. Setting threshold values for HSs in each type of media (sediment, water, biota)

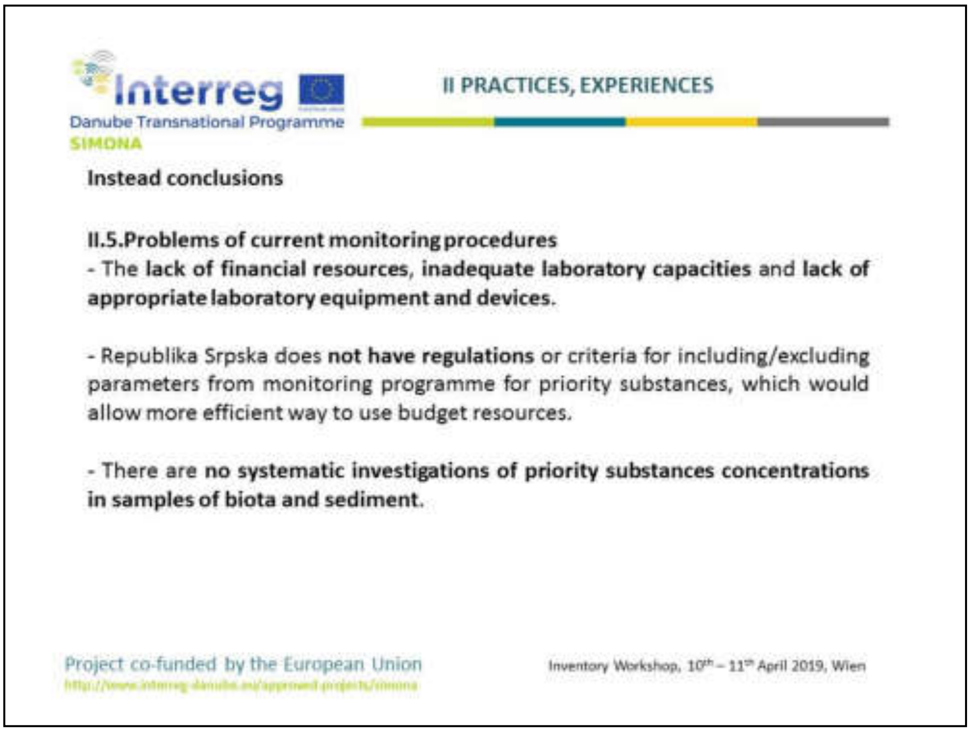
Threshold values for HSs are set only for water samples in Regulation on water classification and categorization of water courses (Official Gazette of Republika Srpska 41/01) which is available at http://www.voders.org/propisi-i-obrasci/pravna-regulativa/.

V.2. *Threshold values for HSs are fixed.*

All the answers are supported with references (national legislative documents and/or web links)

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

Inventory Workshop, 10th – 11th April 2019, Wien


Interreg
Danube Transnational Programme
SIMONA
II PRACTICES, EXPERIENCES
Instead conclusions
II.5.Problems of current monitoring procedures
- The lack of financial resources, inadequate laboratory capacities and lack of appropriate laboratory equipment and devices.
- Republika Srpska does not have regulations or criteria for including/excluding parameters from monitoring programme for priority substances, which would allow more efficient way to use budget resources.
- There are no systematic investigations of priority substances concentrations in samples of biota and sediment.
Project co-funded by the European Union
Inventory Workshop, 10th – 11th April 2019, Wien

BULGARIA


Interreg
Danube Transnational Programme
SIMONA
DTP2-093-2.1 SIMONA
Monitoring of Hazardous Substances in Surface Water Sediments from the Danube River Basin in Bulgaria
Milena Vetseva, Irena Peytcheva, Atanas Hikov, Zlatka Milakovska, Petyo Filipov,
Geological Institute, Bulgarian Academy of Sciences
Inventory Workshop Meeting,
Vienna, Austria
April 10-11th, 2019
Project co-funded by the European Union

Interreg
Danube Transnational Programme
SIMONA

HSs Monitoring in Bulgaria
Responsible Institutions

1. Responsible National Institutions for the monitoring of HSs in river sediments in Bulgaria

1.1 Ministry of Environment and Waters through Directorate of Water Management

Functions: **responsible for the policy on water management on national level**

MoEW develops and implements the state policy on environmental protection: establishes and develops a legal and strategic framework, EU objectives and national environmental priorities; implements the environmental sectoral policies; monitors the current state of ecosystems; provides access to up-to-date information on the state of the environment and the ongoing environmental policy

1.2 Danube Region Basin Directorate

Functions: **performs management, regulatory, information and control functions**

The management functions of the Directorate consist mainly of the **elaboration of a River Basin Management Plan** and a Plan for the management of flood risks

1.3 Executive Environment Agency

Functions: **management, coordination and information functions**

designs and manages the National System for Environmental Monitoring and information on the state of environmental components and factors on the complete territory of the country; National Reference Centre within the European Environment Agency (EEA)

Interreg
Danube Transnational Programme
SIMONA

HSs Monitoring in Bulgaria
Responsible Institutions

Ministry of Regional Development and Public Works

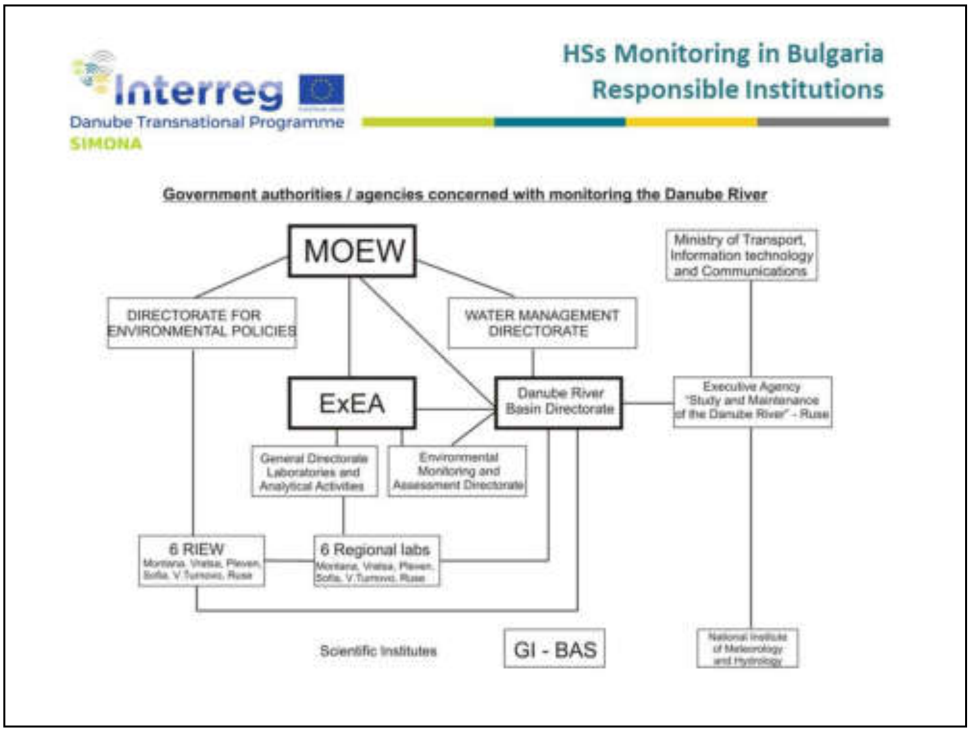
MRDPW through the Territorial Cooperation Management Directorate is the National Authority and National Contact Point for the INTERREG DTP.

National Institute of Meteorology and Hydrology

NIMH at Bulgarian Academy of Sciences - participates in Action 2.1 with two projects: Danube River Basin Enhanced Flood Forecasting Cooperation (DAREFFORT) and Danube Sediment Management - Restoration of the Sediment Balance in the Danube River (DANUBE SEDIMENT).

National Institute of Geophysics, Geodesy and Geography

NIGGG - partner of GI-BAS in the RoBuHaz project ("Romanian–Bulgarian cross-border joint natural and technological hazards assessment in the Danube floodplain. The Calafat-Vidin – Turnu Măgurele-Nikopole sector") finalized in 2013.


HSs Monitoring in Bulgaria
Responsible Institutions
Interreg
Danube Transnational Programme
SIMONA
Government authorities / agencies concerned with monitoring the Danube River
MOEW
Ministry of Transport, Information technology and Communications
DIRECTORATE FOR ENVIRONMENTAL POLICIES
WATER MANAGEMENT DIRECTORATE
ExEA
Danube River Basin Directorate
Executive Agency "Study and Maintenance of the Danube River" - Ruse
General Directorate Laboratories and Analytical Activities
Environmental Monitoring and Assessment Directorate
6 RIEW
6 Regional labs
Scientific Institutes
GI - BAS
National Institute of Meteorology and Hydrology


HSs Monitoring in Bulgaria
Legal framework
Interreg
Danube Transnational Programme
SIMONA
2. Main European and National documents, applied in the development of the national program for the monitoring of sediment in surface waters:
Water Framework Directive 2013/39/EC (2000/60/EO ,82/176/EИO, 83/513/EИO, 84/156/EИO, 84/491/EИO, 86/280/EИO, 2008/105/EO)
Guidance document 19 – on surface water chemical monitoring under the WFD;
Guidance document 25 – on chemical monitoring of sediment and biota under the WFD;
National Water Law;
National Regulation for characteristics of the surface waters;
National Regulation for water monitoring;
National Regulation for quality standards for priority substances and other hazardous substances in the environment ;
National laws and regulation regarding the quality, monitoring, and maximum allowable concentrations of hazardous substances in soils;
Project "Survey and assessment of surface water chemical status", 2014-2017, MOEW, "AKBA-ENV" Consortium;

Interreg
Danube Transnational Programme
SIMONA

HSs Monitoring in Bulgaria
Current Status

3. Type of sediments sampled for measuring HSs in surface waters sediments

→ bottom sediments only

4. Sediment Sampling Strategy

→ River Basin Management Plans (2016-2021)

→ Monitoring locations – 35 sites for the Danube River Basin in Bulgaria

→ Frequency of sediment sampling – 1 per 3 years

Interreg
Danube Transnational Programme
SIMONA

Sediment Monitoring sites
Danube river basin, Bulgaria

№	Point code	Point name	River basin	Water body name	Monitoring type
1	BG1DU00039MS050	The Danube at Baikal	Danube	**Danube**	TNMN
2	BG1DU01119MS010R	The Danube at Novo selo, right bank	Danube	**Danube**	S,TNMN
3	BG1DU00999MS100R	The Danube, Silistra port, right bank	Danube	**Danube**	S,TNMN
4	BG1IS00119MS020	Iskar at Orehovitsa	Iskar	**Iskar**	S,TNMN
5	BG1IS00031MS090	Iskar at Rebarkovo	Iskar	**Iskar**	O
6	BG1IS00039MS120	Iskar at Novi Iskar	Iskar	**Iskar**	O
7	BG1IS00021MS050	Malak Iskar at Roman	Iskar	**Malak Iskar**	S
8	BG1IS00061MS150	Lesnovska before entering Iskar	Iskar	**Stari Iskar**	O
9	BG1IS00381MS110	Batuliiska before entering Iskar at Batuliya village	Iskar	**Batuliiska**	S
10	BG1IS00016MS040	Zlatna Panega before entering Iskar at Cherven bryag	Iskar	**Zlatna Panega**	S
11	BG1NV00093MS020	Nishava at Kalotina	Nishava	**Nishava**	S
12	BG1ER00033MS020	Erma at Tran	Erma	**Erma**	S
13	BG1OG00001MS010	Ogosta before entering the Danube at Oryahovo	Ogosta	**Ogosta**	S

Interreg Danube Transnational Programme SIMONA

Sediment Monitoring sites Danube river basin, Bulgaria

№	Point code	Point name	River basin	Water body name	Monitoring type
14	BG1OG00739MS031	Dam „Ogosta"	**Ogosta**	**Ogosta Dam**	S
15	BG1OG00211MS020	Skat, after Misia	**Ogosta**	Skat	S
16	BG1OG00611MS090	Botunya before entering Ogosta, Ohrid	**Ogosta**	**Botunya**	S
17	BG1WO00014MS140	Timok at Bregovo	Rivers W of Ogosta	**Timok**	O
18	BG1WO00061MS030	Lom before Lom town	Rivers W of Ogosta	**Lom**	S
19	BG1WO00811MS010	Tsibritsa at Dolni Tsibar	Rivers W of Ogosta	**Tsibritsa**	O
20	BG1WO00003MS090	Vidbol after Dunavtsi, before entering the Danube	Rivers W of Ogosta	**Vidbol**	O
21	BG1WO00413MS070	Archar at Archar village	Rivers W of Ogosta	**Archar**	S
22	BG1WO00211MS120	Topolovets at Vidin ,before entering the Danube	Rivers W of Ogosta	**Topolovets**	S
23	BG1OS00037MS010	Osam at Cherkovitsa	**Osam**	**Osam**	S
24	BG1OS00799MS060	Osam after Troyan	**Osam**	**Osam**	O
25	BG1VT00011MS010	Vit after Gulyantsi	Vit	**Vit**	S

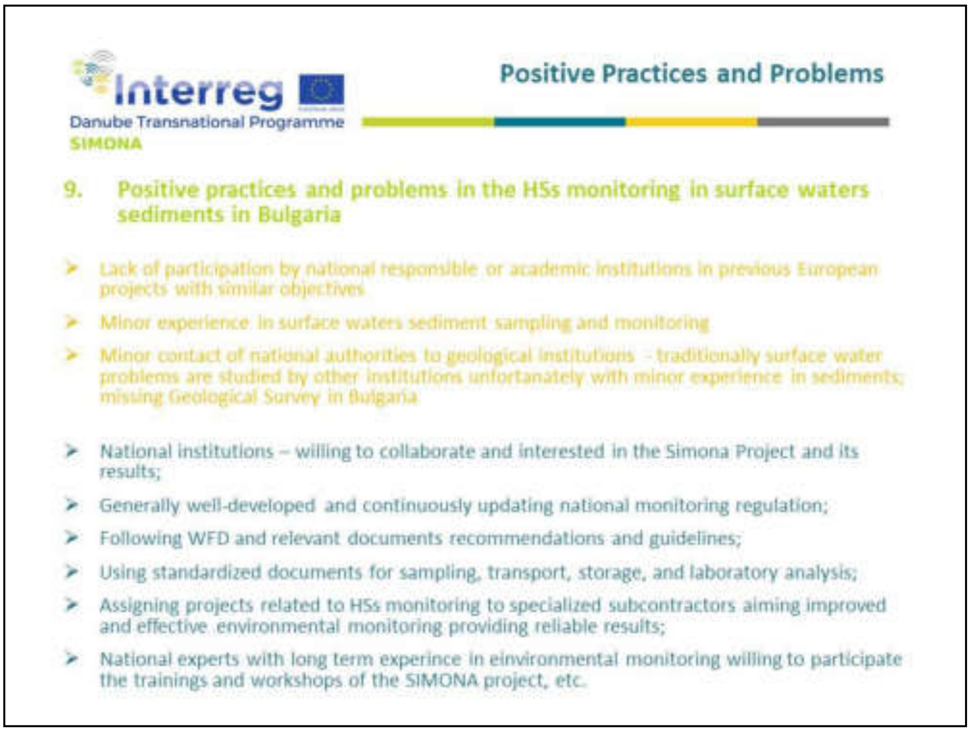
Interreg Danube Transnational Programme SIMONA

Sediment Monitoring sites Danube river basin, Bulgaria

№	Point code	Point name	River basin	Water body name	Monitoring type
26	BG1VT99111MS060	Vit, after Teteven	Vit	**Beli Vit**	S
27	BG1VT00055MS040	Vit, after Sadovets	Vit	Vit	S
28	BG1RL00001MS020	Rusenski Lom at Basarbovo	Rusenski Lom	**Rusenski Lom**	O,TNMN
29	BG1RL09391MS100	Beli Lom after Razgrad	Rusenski Lom	**Beli Lom**	O
30	BG1YN00001MS010	Yantra- Novograd	Yantra	Yantra	S
31	BG1YN08319MS1010	Yantra at Dolna Studena bridge	Yantra	Yantra	O
32	BG1YN04111MS050	Rositsa before entering Yantra - Polikraishte	Yantra	**Rositsa**	O
33	BG1YN00061MS140	Lefedga before entering Yantra- Bryagovitsa	Yantra	Lefedga	S
34	BG1YN00319MS030	Yantra at Karantsi	Yantra	Yantra	S,TNMN
35	BG1YN43199MS021	Dam "Alexander Stamboliiski"	Yantra	**"Al. Stamobliiski' Dam**	S


Interreg
Danube Transnational Programme
SIMONA
HSs Monitoring in Bulgaria
HSs measured in sediments
5. Analyzed hazardous substances in sediments from surface waters in Bulgaria
→ № 2, 5, 6, 7, 12, 15, 16, 17, 18, 20, 21, 26, 28 и 30 from the priority substances list of the WFD
• EU2 - Anthracene
• EU5 - Brominated diphenylethers
• EU6 - Cadmium and its compounds
• EU7 - C10-13 Chloroalkanes
• EU12 - Di(2-ethylhexyl)- Phthalate (DEHP)
• EU15 - Fluoranthene
• EU16 - Hexachloro-benzene
• EU17 - Hexachloro-butadiene
• EU18 - Hexachloro-cyclohexane
• EU20 - Lead and its compounds
• EU21 - Mercury and its compounds
• EU26 - Pentachlorobenzene
• EU28 - Polyaromatic hydrocarbons (PAH)
• EU30 - Tributyltin compounds (Tributyltin cation)
→ № 34, 35, 36, 37, 43 and 44 – added from 2019
+ TOC content; 0,063 mm grain fraction content
6. Quality Standards for hazardous and/or priority substances in sediments from surface waters – not regulated in Bulgaria

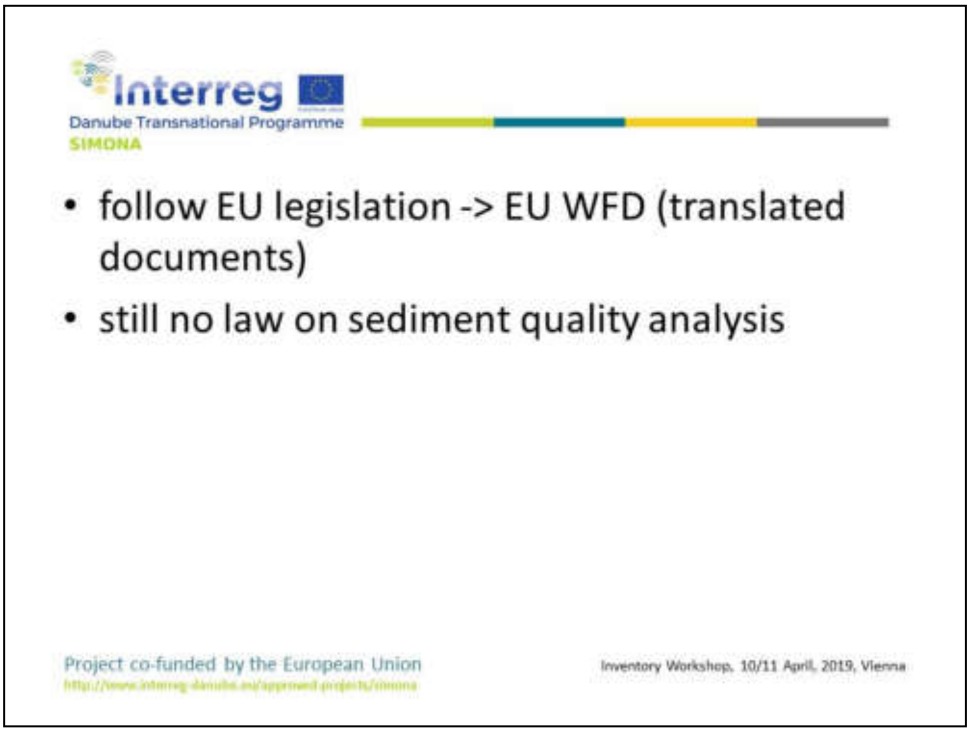

Interreg
Danube Transnational Programme
SIMONA
HSs Monitoring in River Sediments
Current Status in Bulgaria
8. National and international guides of techniques on the design of sampling, transport, storage, and sample preparation
➤ БДС ISO 5667-12:2017 – Water quality. Sampling – bottom sediments from rivers, lakes, and estuary zones
➤ БДС EN ISO 15009:2016 – Soil quality. Gas-chromatographic determination of volatile aromatic HCs, naphtalene and volatile halogenated HCs
➤ БДС EN 16171:2016 – Sediments, processed bio-wastes, and soils. ICP-MS elements determinations.
➤ ISO 18287:2006 – Soil quality. Determination of polycyclic aromatic hydrocarbons (PAH). Gas chromatographic method with mass spectrometric detection (GC-MS);
➤ ISO 11277:2009 – Soil quality. Determination of particle size distribution in mineral soil material. Method by sieving and sedimentation;
➤ БДС ISO 14235:2002 – Soil quality. Organic carbon determination by sulphochromic oxidation;
➤ ILM 4006/2010 – Organochlorine pesticides and polychlorinated biphenyls determination in soils, sediments, and sludge;

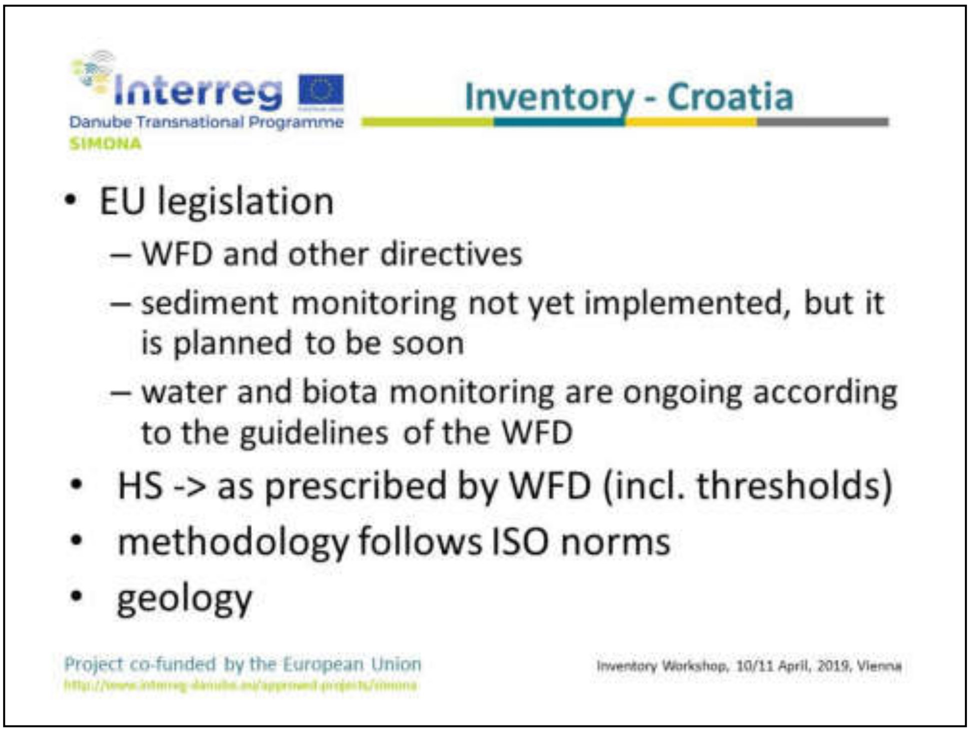

Interreg
Danube Transnational Programme
SIMONA
Positive Practices and Problems
9. Positive practices and problems in the HSs monitoring in surface waters sediments in Bulgaria
Lack of participation by national responsible or academic institutions in previous European projects with similar objectives
Minor experience in surface waters sediment sampling and monitoring
Minor contact of national authorities to geological institutions - traditionally surface water problems are studied by other institutions unfortanately with minor experience in sediments; missing Geological Survey in Bulgaria
National institutions – willing to collaborate and interested in the Simona Project and its results;
Generally well-developed and continuously updating national monitoring regulation;
Following WFD and relevant documents recommendations and guidelines;
Using standardized documents for sampling, transport, storage, and laboratory analysis;
Assigning projects related to HSs monitoring to specialized subcontractors aiming improved and effective environmental monitoring providing reliable results;
National experts with long term experince in einvironmental monitoring willing to participate the trainings and workshops of the SIMONA project, etc.

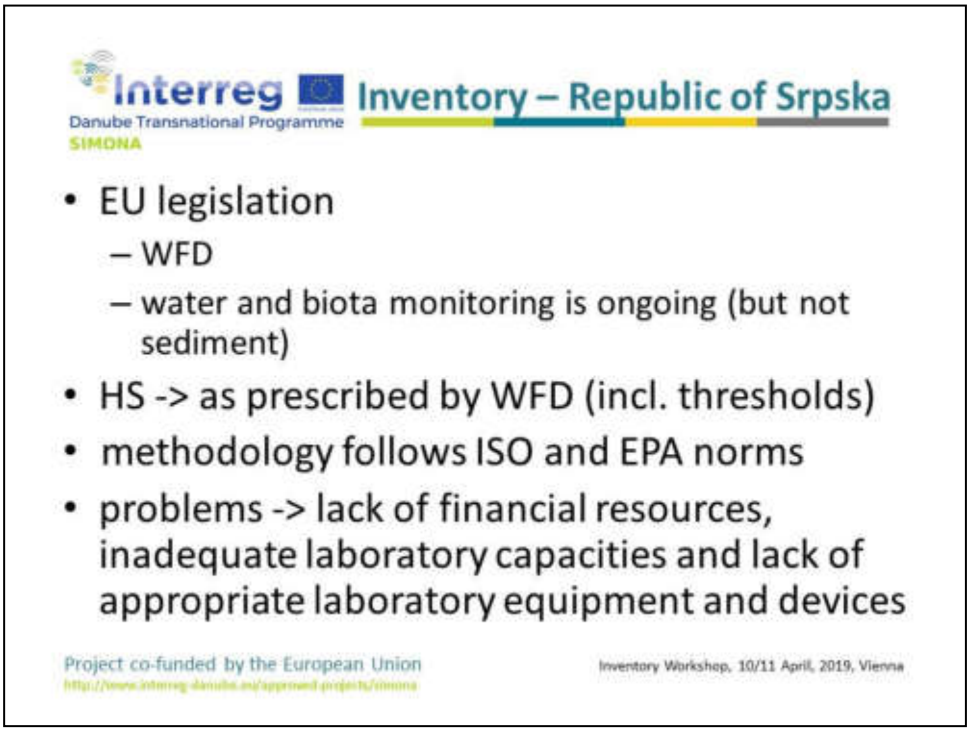
CROATIA


Interreg
Danube Transnational Programme
SIMONA
WP3 Inventory – Croatia, Republic of Srpska
Project Team: Ajka Šorša, Ana Čaić Janković, Ivan Mišur & Danijel Ivanišević
Croatian Geological Survey
Inventory Workshop at the Geological Survey of Austria, Vienna
10/11 of April, 2019
Project co-funded by the European Union


Interreg
Danube Transnational Programme
SIMONA
Croatia
Republic of Srpska
Bosnia i Herzegovina
Sava
• Inventory:
• in collaboration with ASPs
• inventory -> answers to questionnaire + monitoring stations locations
Project co-funded by the European Union
Inventory Workshop, 10/11 April, 2019, Vienna

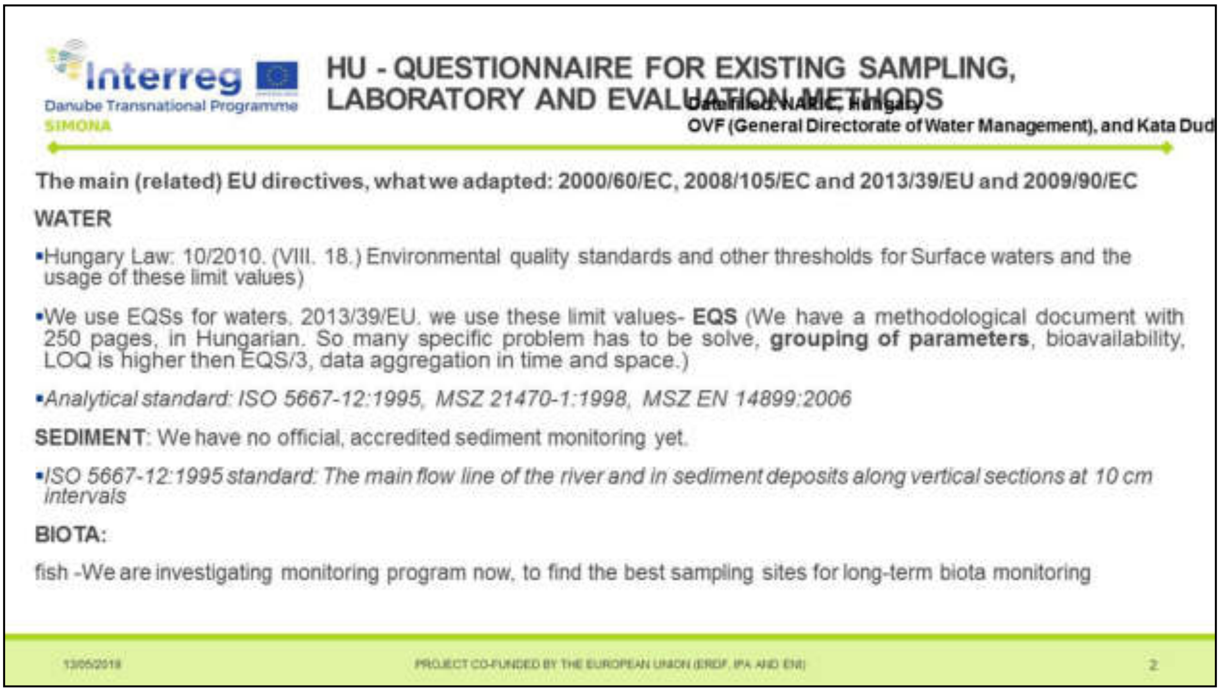

Interreg
Danube Transnational Programme
SIMONA
• follow EU legislation -> EU WFD (translated documents)
• still no law on sediment quality analysis
Project co-funded by the European Union
Inventory Workshop, 10/11 April, 2019, Vienna


Interreg
Danube Transnational Programme
SIMONA
Inventory - Croatia
• EU legislation
– WFD and other directives
– sediment monitoring not yet implemented, but it is planned to be soon
– water and biota monitoring are ongoing according to the guidelines of the WFD
• HS -> as prescribed by WFD (incl. thresholds)
• methodology follows ISO norms
• geology
Project co-funded by the European Union
Inventory Workshop, 10/11 April, 2019, Vienna


Interreg
Danube Transnational Programme
SIMONA
Inventory – Republic of Srpska
• EU legislation
– WFD
– water and biota monitoring is ongoing (but not sediment)
• HS -> as prescribed by WFD (incl. thresholds)
• methodology follows ISO and EPA norms
• problems -> lack of financial resources, inadequate laboratory capacities and lack of appropriate laboratory equipment and devices
Project co-funded by the European Union
Inventory Workshop, 10/11 April, 2019, Vienna

HUNGARY


Interreg
Danube Transnational Programme
SIMONA
SIMONA - HU
INVENTORY WORKSHOP, VIENNA
10-11 APRIL 2019
GYOZO JORDAN, HU-SZIE
KATALIN MARIA DUDÁS, HU-NARIC
PRESENTER:
ZSÓFIA KOVÁCS
REPRESENTING GENERAL DIRECTORATE OF WATER MANAGEMENT IN HUNGARY
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
1


Interreg
Danube Transnational Programme
SIMONA
HU - QUESTIONNAIRE FOR EXISTING SAMPLING, LABORATORY AND EVALUATION METHODS
OVF (General Directorate of Water Management), and Kata Dud
The main (related) EU directives, what we adapted: 2000/60/EC, 2008/105/EC and 2013/39/EU and 2009/90/EC
WATER
•Hungary Law: 10/2010. (VIII. 18.) Environmental quality standards and other thresholds for Surface waters and the usage of these limit values)
•We use EQSs for waters. 2013/39/EU. we use these limit values- EQS (We have a methodological document with 250 pages, in Hungarian. So many specific problem has to be solve, grouping of parameters, bioavailability, LOQ is higher then EQS/3, data aggregation in time and space.)
•Analytical standard: ISO 5667-12:1995, MSZ 21470-1:1998, MSZ EN 14899:2006
SEDIMENT: We have no official, accredited sediment monitoring yet.
•ISO 5667-12:1995 standard: The main flow line of the river and in sediment deposits along vertical sections at 10 cm intervals
BIOTA:
fish -We are investigating monitoring program now, to find the best sampling sites for long-term biota monitoring
PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI)
2

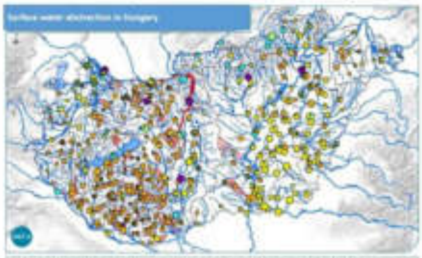
Interreg Danube Transnational Programme SIMONA

HU - QUESTIONNAIRE FOR EXISTING SAMPLING, LABORATORY AND EVALUATION METHODS

Danube River Quality Monitoring Stations

KTJ	Name	Sampling location	EOV_X	EOV_Y
101178209	Duna	Budapest, upsteam	227275	647450
101178195	Duna	Budapest, downstream	249640	652137
101845862	Duna	Göd	259782	655720
101178184	Duna	Szob, Ipoly downstream	274405	635980
101178151	Duna	Medvei bridge, - 1806,2 river km	273142	545431
101178162	Duna	Rajka gaging station, - 1848,4 fkm	297123	515673
101178210	Duna	Solt	182925	641290
101178232	Duna	Hercegszántó	82700	631897
101178807	Duna	Szob	278084	635883
101180545	Duna	Komárom, Vág upstream, - 1766,8 fkm	267891	580519

These are the main sites (surveillance monitoring network).



RIVER BASIN MANAGEMENT PLAN (VGT2 2009-2015)
www.vizeink.hu

- In-situ measurement: pH (MSZ 1484-22:2009, illetve MSZ EN ISO 10523:2012), conductivity (MSZ EN ISO 27888:1998) temperature (MSZ 448-2:1967
- Government - 7 Accreditated Laboratory - use standards

13/05/2018 PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI) 3

Interreg Danube Transnational Programme SIMONA

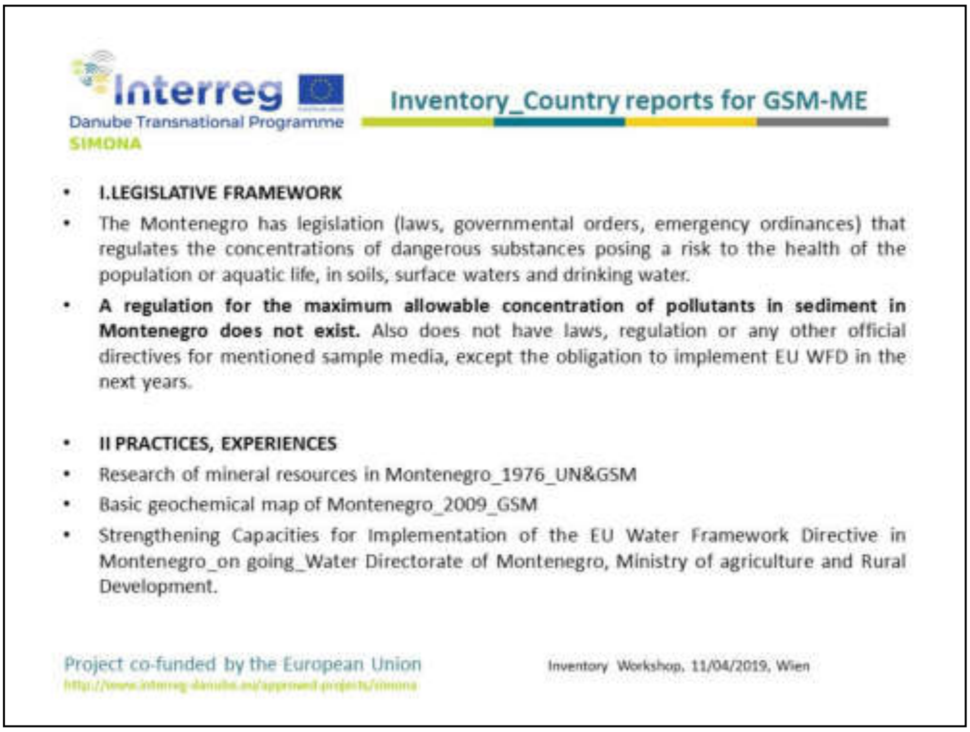
ADDITIONAL QUESTIONS

- How many monitoring sites were identify – all partners?
- Apply the grouping techniques?
- What kind of samples should be taken (water/sed/biota)?
- What do you think do you have enought measurements to well-descibe the chemical status of the water bodies?
- What sampling frequency is your country's practice (b and d column), and what do you think what is the ideal sampling frequency (c and e column) based on your experties, for the following sampling matrices?
- Using the Biotic Ligandum Model (BLMs)
  - -other corrections
  - -define local EQSs?
- Useing total toxicity tests?
- Classifcation means: Make a decision, that the water body is good or bad (the avarage concentration is bigger or lower then the AA-EQS)?
- Does your national legislative find categories of environment quality based on deviations from threshold values?

13/05/2018 PROJECT CO-FUNDED BY THE EUROPEAN UNION (ERDF, IPA AND ENI) 4

MONTENEGRO


Interreg
Danube Transnational Programme
SIMONA
SIMONA_Inventory _Country reports for GSM-ME
Neda Dević, Geological survey of Montenegro, GSM-ME
Inventory workshop,
Geological survey of Austria, Wien
11 April 2019
Project co-funded by the European Union


Interreg
Danube Transnational Programme
SIMONA
Inventory_Country reports for GSM-ME
I.LEGISLATIVE FRAMEWORK
The Montenegro has legislation (laws, governmental orders, emergency ordinances) that regulates the concentrations of dangerous substances posing a risk to the health of the population or aquatic life, in soils, surface waters and drinking water.
A regulation for the maximum allowable concentration of pollutants in sediment in Montenegro does not exist. Also does not have laws, regulation or any other official directives for mentioned sample media, except the obligation to implement EU WFD in the next years.
II PRACTICES, EXPERIENCES
Research of mineral resources in Montenegro_1976_UN&GSM
Basic geochemical map of Montenegro_2009_GSM
Strengthening Capacities for Implementation of the EU Water Framework Directive in Montenegro_on going_Water Directorate of Montenegro, Ministry of agriculture and Rural Development.
Project co-funded by the European Union
Inventory Workshop, 11/04/2019, Wien

Interreg Danube Transnational Programme SIMONA

Inventory_Country reports for GSM-ME

- II.3 Existent waterbodies (rivers in Montenegro) and sampling sites(Ramsar,Natura2000 etc.) and current quality monitoring stations of the Danube River Danube River Quality Monitoring Stations (site on rivers)_22 places.

- **III.INVENTORY OF SAMPLING METHODOLOGIES**
- **III.1.Water_ Institute of Hydrometerology and seismology of Montenegro**

- **III.2 Sediment**
- **Collection of geochemical samples and their systematization**
- All samples are taken from those streams that are visible on the topographic map 1: 200 000. The samples were taken from the smallest fractions of the coating, cleansed of large pieces and organic mattec The sample is packed in plastic bags with the inscription of the sample. The data on the sample were recorded in a form containing: sample mark, line III, stream name, topographic sheet 1:25 000, petrographic composition of the sample, the edges of the surrounding rocks.
- Table for samples of stream sediments has 9 columns:
- 1. regular sample number
- 2. sample designation
- 3. name of the stream from which it was taken
- 4. x coordinates
- 5. y coordinate
- 6. angle (read from topographic map 1:25 000)
- 7. macroscopic provision of currencies
- 8. possible origin of the material
- 9. Possible polluters

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

Inventory Workshop, 11/04/2019, Wien

Interreg Danube Transnational Programme SIMONA

Inventory_Country reports for ME-GSM

- **III.3. Biota_Expert staff of the Agency for the Protection of Nature and Environment implements a biodiversity monitoring program from 2013, the locations of the monitoring program are different each year.**

- Important laboratory
- 1. **Institute of Hydrometerology and seismology of Montenegro,** http://www.meteo.co.me/ekologija/Akreditacija.pdf
- **2. Institute for Public Health from Podgorica,**
- **3. Center for Eco-Toxicology Research from Podgorica,–** http://eng.ceti.me/?page_id=3610

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

Inventory Workshop, 11/04/2019, Wien

ROMANIA

Interreg Danube Transnational Programme SIMONA

TECHNICAL UNIVERSITY OF CLUJ-NAPOCA ROMANIA

INSTITUTUL GEOLOGIC AL ROMÂNIEI GEOLOGICAL INSTITUTE OF ROMANIA

Inventory Workshop of the SIMONA Project

Romanian partners progress of activities

10-11.04.2019, Vienna, Austria

Interreg Danube Transnational Programme SIMONA

TECHNICAL UNIVERSITY OF CLUJ-NAPOCA ROMANIA

INSTITUTUL GEOLOGIC AL ROMÂNIEI GEOLOGICAL INSTITUTE OF ROMANIA

I. LEGISLATIVE FRAMEWORK

- I.1 – finalized
- I.2 – soil data completed (4 quality classes depending on soil type use), for drinking water there's only one set of values (maximum admissible concentrations) for sediments there's also only one set of values (there is no specific legislation, but there are included in environment protection legislation), biota (there is no specific legislation, only in the fishing legislation, and it's monitored in the case of water quality assessment)
- I.3 – finalized. Regarding river water 4 quality classes exist.
- I.4 – For all parameters included in the national legislation regarding pollution (air, river waters, drinking water, soils, sediments and biota) there are ISO or EPA analytical standards. Those are listed in the final version of the national questionnaire.
- I.5 – The national legislation does not include toxicity tests, only in the case of aquatic environments, but within various projects, those tests are being performed in biology institutes laboratories.
- I.6 – completed (ISO standards)

Interreg Danube Transnational Programme SIMONA

TECHNICAL UNIVERSITY OF CLUJ-NAPOCA ROMANIA

INSTITUTUL GEOLOGIC AL ROMÂNIEI GEOLOGICAL INSTITUTE OF ROMANIA

II. PRACTICES, EXPERIENCES

- II.1 – 28 national and international projects on Danube River and tributaries.
- II.2 – 137 papers (we included a selected list of 137 papers – some of them in English language – regarding hazardous substances, from a database of over 5.000 scientific works regarding Danube River).
- II.3 – finalized for Upper Tisa Catchment and Danube River
- II.4 – only EEA data and metadata; complete list for Tisa Catchment economic agents. The list with all the Romanian economic agents is publicly available. Further more, The National Water Administration publishes (since 2010) annual reports regarding the main river polluters and water bodies quality.
- II.5 – imposed by legislation, but not specific measures indicated.

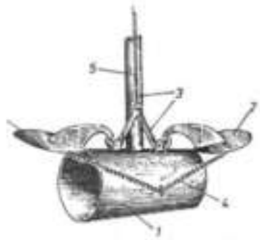
Interreg Danube Transnational Programme SIMONA

TECHNICAL UNIVERSITY OF CLUJ-NAPOCA ROMANIA

INSTITUTUL GEOLOGIC AL ROMÂNIEI GEOLOGICAL INSTITUTE OF ROMANIA

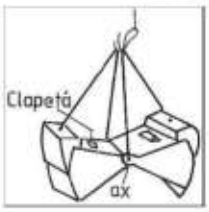
III. INVENTORY OF SAMPLING METHODOLOGIES

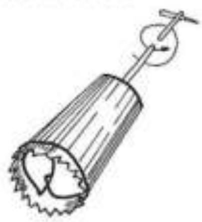
Suspended sediments



Rapid collector Nansen bottle (cylinder with flaps). The cylinder (1) is inserted at the point of collection with the flaps (2) raised and reinforced by a simple arming-tripping system (3). By the trigger, the flaps close suddenly, pulled by the springs (4).

River bed sediments





Sampling from the river bed (under water) is done with GRAIFER, CAROTIER.
From the floodplain (dry sampling) sediments are collected with an ordinary shovel.

IV. INVENTORY OF LABORATORY METHODOLOGIES

- There is a list with analytical equipment regarding metals, ions, organic molecular compounds analysis, together with corresponding analytical standards (ISO and EPA), detection limit and methods accuracy.
- There are national accredited laboratories which perform all these analyses. In RO-IGR and RO-TUCN only metals are analyzed, including new and very new generation equipment, but the laboratories are not certified. Those labs work under ISO standards and can participate to laboratories comparison (especially for Total Hg analysis).

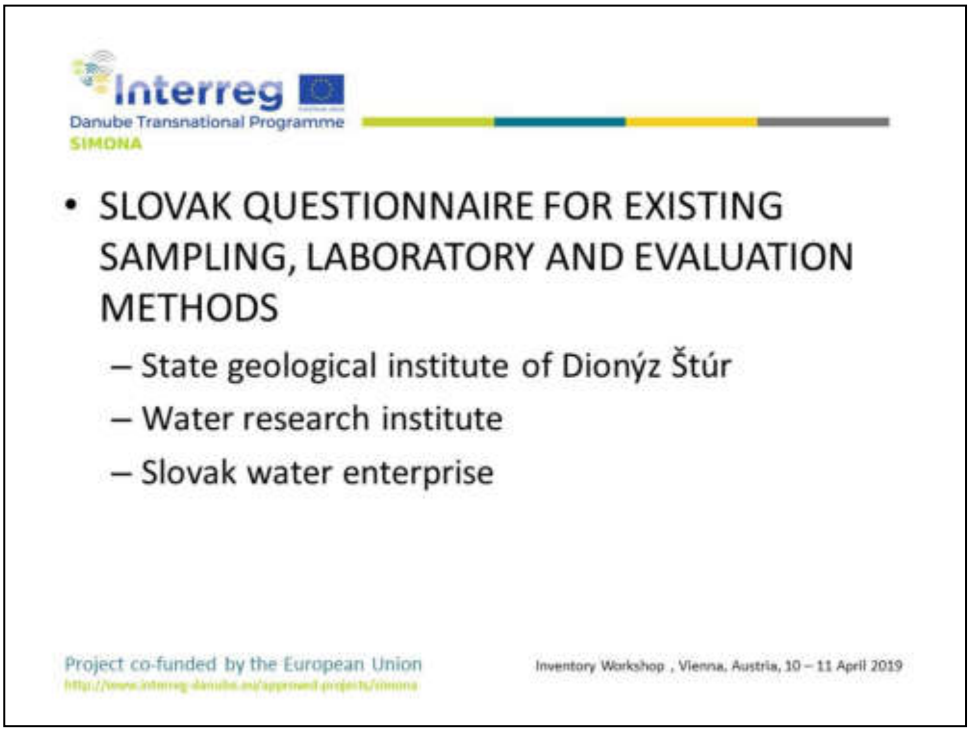
Interreg
Danube Transnational Programme
SIMONA
TECHNICAL UNIVERSITY OF CLUJ-NAPOCA ROMANIA
INSTITUTUL GEOLOGIC AL ROMÂNIEI
GEOLOGICAL INSTITUTE OF ROMANIA

V. INVENTORY OF EVALUATION METHODS

- The quality standard values are established in the national legislation.
- The natural environment and water hardness are not taken into account when establishing pollution thresholds.
- The national legislation includes the monitoring of metals and their toxic compounds
- Bioconcentration is not included in the national legislation
- The national legislation does not include remedial measures.

SLOVAKIA


Interreg
Danube Transnational Programme
SIMONA
SIMONA WP 3 presentation
Jozef Kordík, Igor Stríček, Jarmila Nováková, Ľudmila Tokarčíková, SGIDS
Pavel Hucko, Vladimír Roško, WRI
Zuzana Hiklová, SWE
Inventory Workshop, Vienna, Austria
10 – 11 April 2019
Project co-funded by the European Union


Interreg
Danube Transnational Programme
SIMONA
• SLOVAK QUESTIONNAIRE FOR EXISTING SAMPLING, LABORATORY AND EVALUATION METHODS
– State geological institute of Dionýz Štúr
– Water research institute
– Slovak water enterprise
Project co-funded by the European Union
Inventory Workshop, Vienna, Austria, 10 – 11 April 2019

Interreg Danube Transnational Programme SIMONA

LEGISLATIVE FRAMEWORK

No	Title (in national language)	Title (in English)	Link	Country
1	Smernica MŽP SR č. 4/1999-3 na zostavovanie a vydávanie Geochemickej mapy riečnych sedimentov v mierke 1:50 000	Directive of the Ministry of Environment of the Slovak Republic no. 4 / 1999-3 for the compilation and issue of a geochemical map of river sediments at a scale of 1:50 000		SK
2	Rozhodnutie MP SR č. 531/1994 o najvyšších prípustných hodnotách škodlivých látok v pôde	Decision no. 531/1994 on maximum levels of harmful substances in soil		SK
3	Metodický pokyn MŽP SR č. 549/98-2 na hodnotenie rizík zo znečistených sedimentov tokov a vodných nádrží	Methodological Instruction of the Ministry of Environment of the Slovak Republic no. 549 / 98-2 for the risk assessment from contaminated sediments of streams and water reservoirs		SK
4	Smernica MŽP SR č. 1/2015-7 na vypracovanie analýzy rizika znečisteného územia	Directive of the Ministry of Environment of the Slovak Republic no. 1 / 2015-7 to develop a risk analysis of the contaminated area		SK
10	Zákon č. 188/2003 Z.z. z 23. apríla 2003 o aplikácii čistiarenského kalu a dnových sedimentov do pôdy	Act no. 188/2003 Coll. on the application of sludge and bottom sediments to soil	www.slov-lex.sk	SK
11	Vyhláška MŽP SR č. 283/2001 o vykonaní niektorých ustanovení zákona o odpadoch	Decree of the Ministry of Environment of the Slovak Republic no. 283/2001 on the implementation of certain provisions of the Act on Waste	www.slov-lex.sk	SK
12	Rámcová smernica o odpadoch	Waste Framework Directive	https://eur-lex.europa.eu	SK EU
13	Zákon č. 255/2011 Z.z., ktorým sa mení a dopĺňa zákon č. 514/2008 Z.z. o nakladaní s odpadom z ťažobného priemyslu	Act no. 255/2011 Coll., Amending Act no. 514/2008 Coll. management of waste from the mining industry	www.slov-lex.sk	SK
14	Vyhláška Ministerstva životného prostredia SR č. 372/2015 z 28. júla 2015 o skládkovaní odpadov a dočasnom uskladnení kovovej ortuti	Decree of the Ministry of Environment of the Slovak Republic no. 372/2015 of 28 July 2015 on the landfill of waste and the temporary storage of metallic mercury	www.slov-lex.sk	SK

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

Inventory Workshop , Vienna, Austria, 10 – 11 April 2019

Interreg Danube Transnational Programme SIMONA

LEGISLATIVE FRAMEWORK

Indicator	Methodological instruction of the MoE No. 549/98-2 (mg.kg^{-1})				Methodological instruction of the MoE No. 549/98-2 – water solution (mg.l^{-1})		Decision No. 531/94-540 (mg.kg^{-1})		
	TV	MPC	TVd	IV	TV	MPC	A	B	C
arsenic	29	55	55	55	0,8	25	29	30	50
barium	160	300	-	-	73	220	500	1000	2000
beryllium	1,1	1,2	-	-	0,02	0,2	3	20	30
cadmium	0,8	12	7,5	12	0,08	0,4	0,8	5	20
cobalt	9	19	-	-	0,2	2,8	20	50	300
chromium	100	380	380	380	0,2	8,7	130	250	800
copper	36	73	90	190	0,4	1,5	36	100	500
mercury	0,3	10	1,6	10	0,01	0,2	0,3	2	10
methyl mercury	0,3	1,4	-	-	0,01	0,02			
manganese									
molybdenum	3	200	-	-	2,9	290	1	40	200
nickel	35	44	45	210	3,3	5,1	35	100	500
lead	85	530	530	530	0,2	11	85	150	600
antimony	3	15	-	-	0,3	6,5			
selenium	0,7	2,9	-	-	0,05	5,3	0,8	5	20
tin	-	-	-	-	0,2	18	20	50	300
thalium	1	2,6	-	-	0,04	1,6			
vanadium	42	56	-	-	0,8	4,3	120	200	500
zinc	140	620	720	720	2,8	9,4	140	500	3000
P total									
F total							500	1000	2000
S sulphide							2	20	200
Br total							[illegible]	[illegible]	[illegible]

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

Inventory Workshop , Vienna, Austria, 10 – 11 April 2019

Interreg
Danube Transnational Programme
SIMONA

Analytical standards

- Most accessible methods
  - Atomic Absorption Spectrometry (AAS),
  - Inductively Coupled Plasma – Atomic Emission Spectrometry (ICP - AES),
  - Inductively Coupled Plasma – Mass Spectrometry (ICP - MS),
  - X-ray Fluorescence Spectrometry (XRF)
- Identification of minerals in sediments
  - electron microscopy (SEM, transmisive - TEM) and electron microanalysis or X-ray powder diffraction analysis
- Mobility of the elements
  - colony or batch experiments, one-step extraction methods and sequential extraction methods

Project co-funded by the European Union
http://www.interreg-danube.eu/approved-projects/simona
Inventory Workshop , Vienna, Austria, 10 – 11 April 2019

Interreg
Danube Transnational Programme
SIMONA

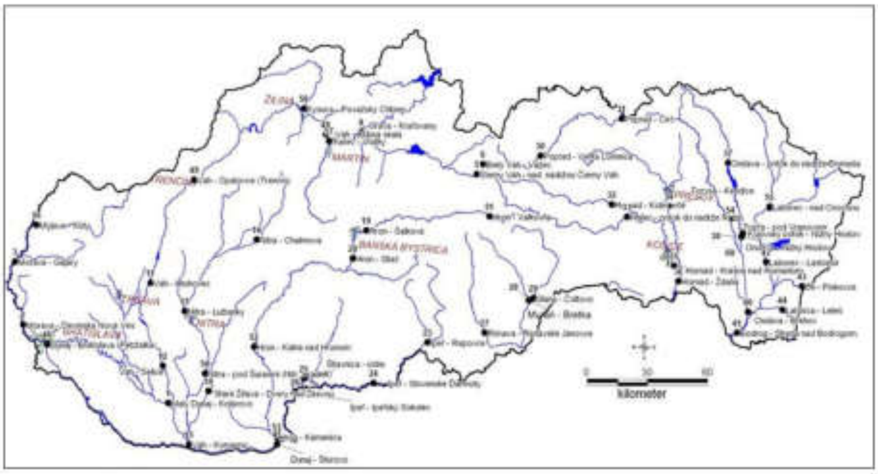
Projects

No.	Project Title (EN)	Year	Project coordinators,Partners
1	Monitoring of river sediments within the Partial Monitoring System of geological factors	1996-ongoing	State geological institute od Dionyz Stur (SGIDS)
2	Evaluation of sediment quality in rivers and water reservoirs	2000-2004	Slovak hydrometeorological institute (SHMI)
3	Geochemical atlas of stream sediments	1991-1999	SGIDS
4	Construction of geochemical maps of river sediments as part of the compilation of maps of geological factors of the environment	1991-2010	SGIDS, private sector
5	Monitoring the impact of the Gabčikovo water works on the quality of surface waters and sediments	1992 – ongoing	WaterWork Company, state enterprise, Bratislava
6	The impact of anthropogenic activity in Zemplinska Širava on the quality of accumulated sediments	1997-2003	Water research institute (WRI)
7	Monitoring of physicochemical and biological elements of water quality in the year 2008	The project was completed in 2008	*SWME, s. e. - realized by its own capacities
10	Monitoring of physicochemical and biological elements of water quality in the year 2015	The project was completed in 2015	*SWME, s. e. - realized by its own capacities
11	Monitoring of physicochemical and biological elements of water quality in the years 2016 - 2020	2016 – 2020. The project is still being implemented	*SWME, s. e. - realized by its own capacities
12	DanubeSediment „Danube Sediment Management - Restoration of the Sediment Balance in the Danube River"	1.1.2017 - 30.6.2019	***LP** – BME, HUNGARY, **PP** – many; **ASP** – many
13	FramWat „Framework for improving water balance and nutrient mitigation by applying small water retention measures"	1.7.2017 – 30.6.2020	***LP** – BME, HUNGARY, **PP** – many; **ASP** – many
14	Monitoring and assessment of water status –Phase III.	1.7.2015 – 31.12.2020	WRI

Project co-funded by the European Union
http://www.interreg-danube.eu/approved-projects/simona
Inventory Workshop , Vienna, Austria, 10 – 11 April 2019

Interreg Danube Transnational Programme
SIMONA

Waterbodies and sampling sites



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

Inventory Workshop , Vienna, Austria, 10 – 11 April 2019

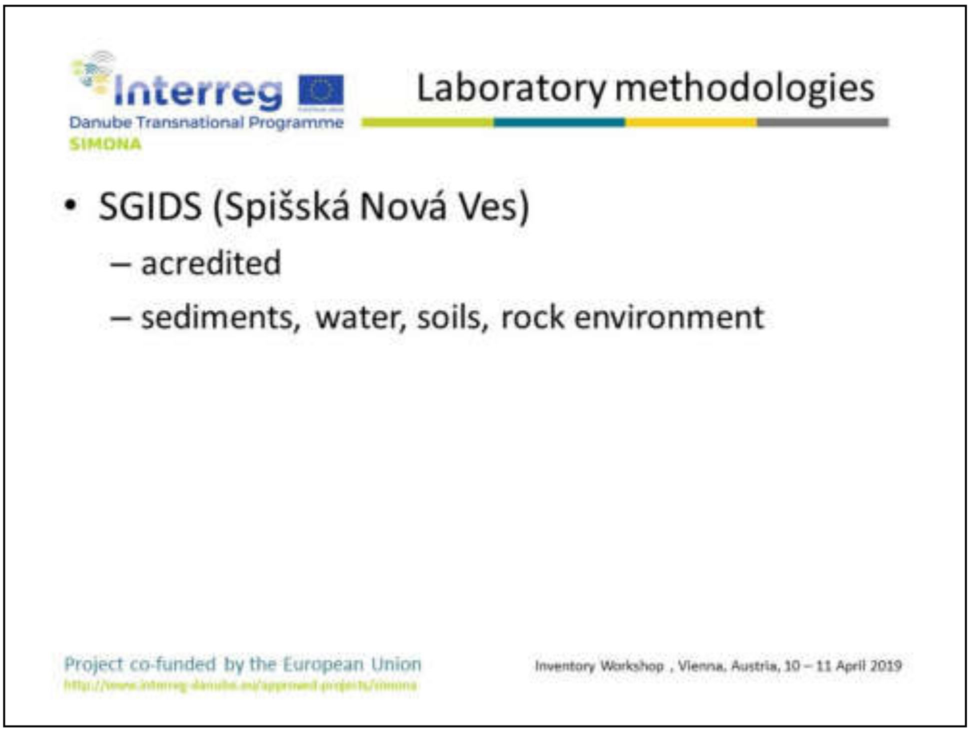
Interreg Danube Transnational Programme
SIMONA

Sampling methodologies

- Geochemical Atlas of Europe – FOREGS
  - Surface water
  - Stream and bottom sediments
  - Floodplain sediments
- Water Research Institute
  - Bottom sediments
- SGIDS
  - Stream sediments

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

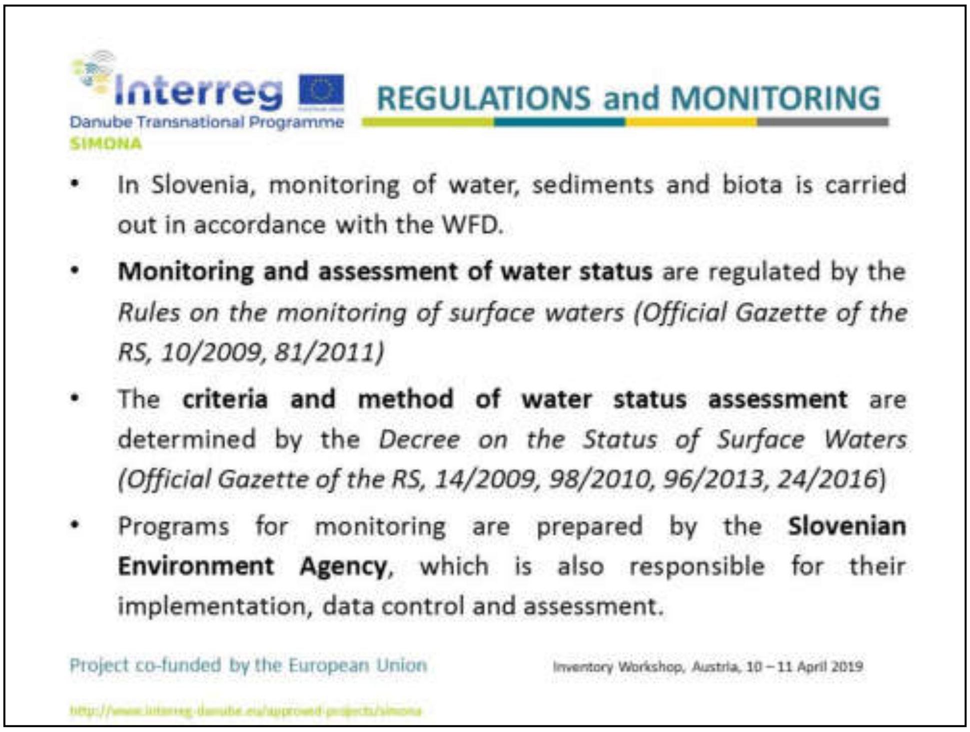
Inventory Workshop , Vienna, Austria, 10 – 11 April 2019


Interreg
Danube Transnational Programme
SIMONA
Laboratory methodologies
• SGIDS (Spišská Nová Ves)
– acredited
– sediments, water, soils, rock environment
Project co-funded by the European Union
Inventory Workshop , Vienna, Austria, 10 – 11 April 2019


Interreg
Danube Transnational Programme
SIMONA
Future tasks
• Some information in the questionnaire missing – fill in soon (biota, inventory of evaluation methods)
• Ready for discussion to finalize protocols, sampling and laboratory methodology (location, measuring compounds and matrices...)
Project co-funded by the European Union
Inventory Workshop , Vienna, Austria, 10 – 11 April 2019

SLOVENIA


Interreg
Danube Transnational Programme
SIMONA
Inventory questionnaire of Slovenia
Dr. Sonja Cerar, Geological Survey of Slovenia
Inventory Workshop, Austria
10 – 11 April 2019
Project co-funded by the European Union


Interreg
Danube Transnational Programme
SIMONA
REGULATIONS and MONITORING
In Slovenia, monitoring of water, sediments and biota is carried out in accordance with the WFD.
Monitoring and assessment of water status are regulated by the Rules on the monitoring of surface waters (Official Gazette of the RS, 10/2009, 81/2011)
The criteria and method of water status assessment are determined by the Decree on the Status of Surface Waters (Official Gazette of the RS, 14/2009, 98/2010, 96/2013, 24/2016)
Programs for monitoring are prepared by the Slovenian Environment Agency, which is also responsible for their implementation, data control and assessment.
Project co-funded by the European Union
Inventory Workshop, Austria, 10 – 11 April 2019

Interreg Danube Transnational Programme SIMONA

REGULATIONS and MONITORING

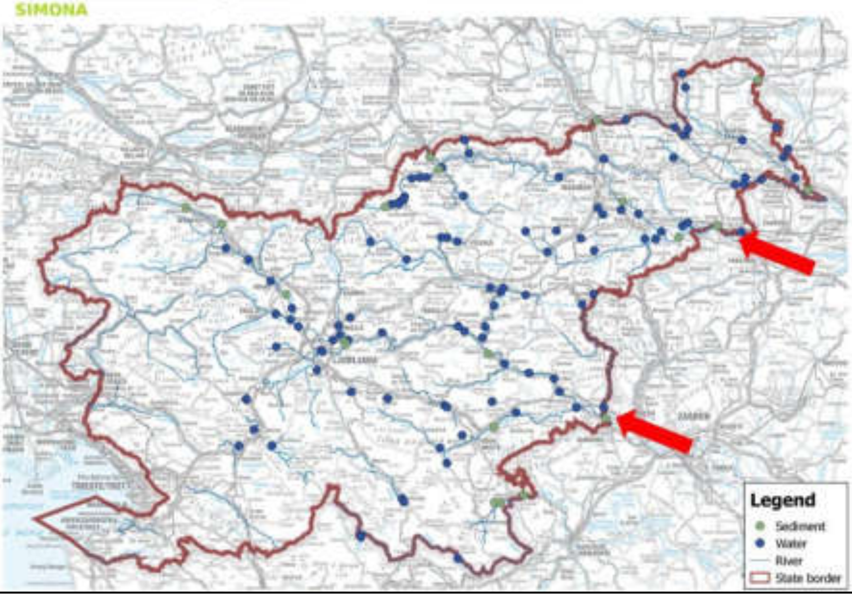
- The monitoring program of the water chemical status for the period 2016 - 2021 has been prepared in accordance with **national and European legislations** (WFD) and in accordance with **international conventions** and **interstate agreements with neighboring countries.**
- Slovenia is involved in the **Transnational Monitoring Network (TNMN)** on the Danube tributaries, on the Sava and the Drava Rivers. These are the locations on the border profiles with Croatia, which are also included in the national program and in the bilateral monitoring with Croatia.

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

Inventory Workshop, Austria, 10 – 11 April 2019

Interreg Danube Transnational Programme SIMONA

MONITORING – Sampling points



Interreg Danube Transnational Programme SIMONA

MONITORING – chemical parameters - water

- Surface water monitoring includes **45 priority substances** of which **21 are priority hazardous substances** (eg. cadmium, mercury, endosulfan, nonylphenol, etc.)
- For these substances a uniform Environmental quality standards (EQS) are set up for water and organizms (fish).
- Monitoring of water in performed at least monthly and for organizms yearly.

Project co-funded by the European Union

Inventory Workshop, Vienna, 10 – 11 April 2019

Interreg Danube Transnational Programme SIMONA

MONITORING – chemical parameters - sediment

- For long-term trend assessment of chemical parameters in waters, monitoring of sediments in fraction < 63 µm is also carried out.
- Chemical parameters for sediments are:

Anthracene, Cadmium and its compounds, Brominated diphenyl ether, Chloroalkanes C10-C13, DEHP, Fluoranthene, Hexachloro-benzene, Hexachloro-butadiene, Hexachloro-cyclohexane, Lead and its compounds, Mercury and its compounds, Pentachloro- benzene, PAH, Tributyltin compounds, Dicofol, PFOS, Quinoxyfen, Dioxins and dioxin-like compounds, HBCDD, Heptachlor and heptachlor epoxide

- Sediments are monitored due to trends every 3 years

Project co-funded by the European Union

Inventory Workshop, Austria, 10 – 11 April 2019

Interreg Danube Transnational Programme SIMONA

MONITORING – sampling and transport

WATER:

Sampling: SIST ISO 5667-6: 2015; Water quality - Sampling - Part 6: Guidance on sampling of rivers and streams

Transport and storage: SIST EN ISO 5667-3: 2013; Water quality - Sampling - Part 3: Preservation and handling of water samples (ISO 5667-3:2012)

SEDIMENT:

Sampling: SIST ISO 5667 – 12:1996; Water quality -- Sampling -- Part 12: Guidance on sampling of bottom sediment

Transport and storage: SIST ISO 5667 – 15: 2010; Water quality - Sampling - Part 15: Guidance on the preservation and handling of sludge and sediment samples (ISO 5667-15:2009)

Project co-funded by the European Union

Inventory Workshop, Austria, 10 – 11 April 2019

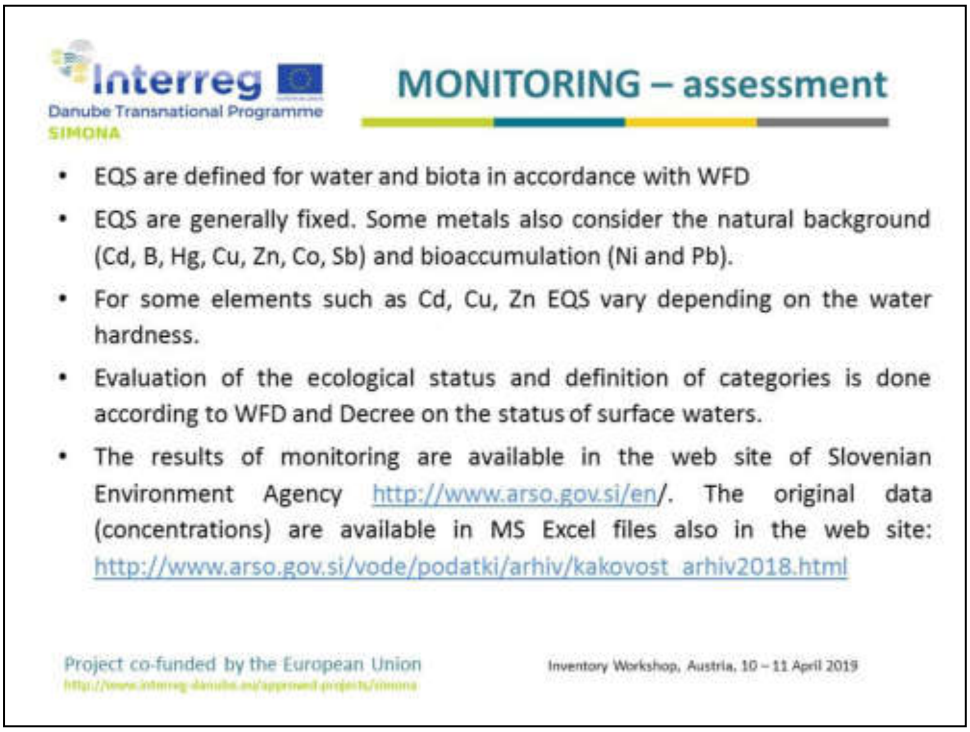
Interreg Danube Transnational Programme SIMONA

MONITORING – chemical analysis

- Sampling and *most of the analyzes* are performed by external laboratory, the Slovenian Environment Agency (ARSO) only carries out analyzes of *metals* in water.
- External laboratory has accreditation for sampling and most of the analytical methods, all in accordance with ISO 17025.
- ARSO has ISO 17025 accreditation to analyse metals in water.
- Analytical methods:
  - Metals = ICP-MS
  - Organic compounds = LC-MS, GC-MS, HPCC, etc.

Project co-funded by the European Union

Inventory Workshop, Austria, 10 – 11 April 2019



Inventory workshop of the SIMONA Project 10 April 2019 Vienna, Austria

Sampling of stream bed sediments

Sebastian Pfleiderer
Geological Survey of Austria
Geologische Bundesanstalt

Past experiences:

- Austrian Standard (ÖNORM G 1031) for geochemical sampling (1979)
- Geochemical Atlas of Austria (1989) (Bohemian Massif and Central Alps) http://opac.geologie.ac.at/ais312/dokumente/AL0028_Gesamt.pdf (29,690 stream sediment samples)
- FOREGS (Salminen et al., 1998) http://tupa.gtk.fi/julkaisu/opas/op_047.pdf (19 floodplain, 12 humus, 18 topsoil 15 subsoil, 20 stream sediment and 20 stream water samples in Austria)
- Geochemical Atlas of Austria (2015) http://opac.geologie.ac.at/ais312/dokumente/AL0028_Gesamt.pdf (36,162 stream sediment samples)

1. **Choice of sampling sites**

- for mineral exploration
  in alpine regions

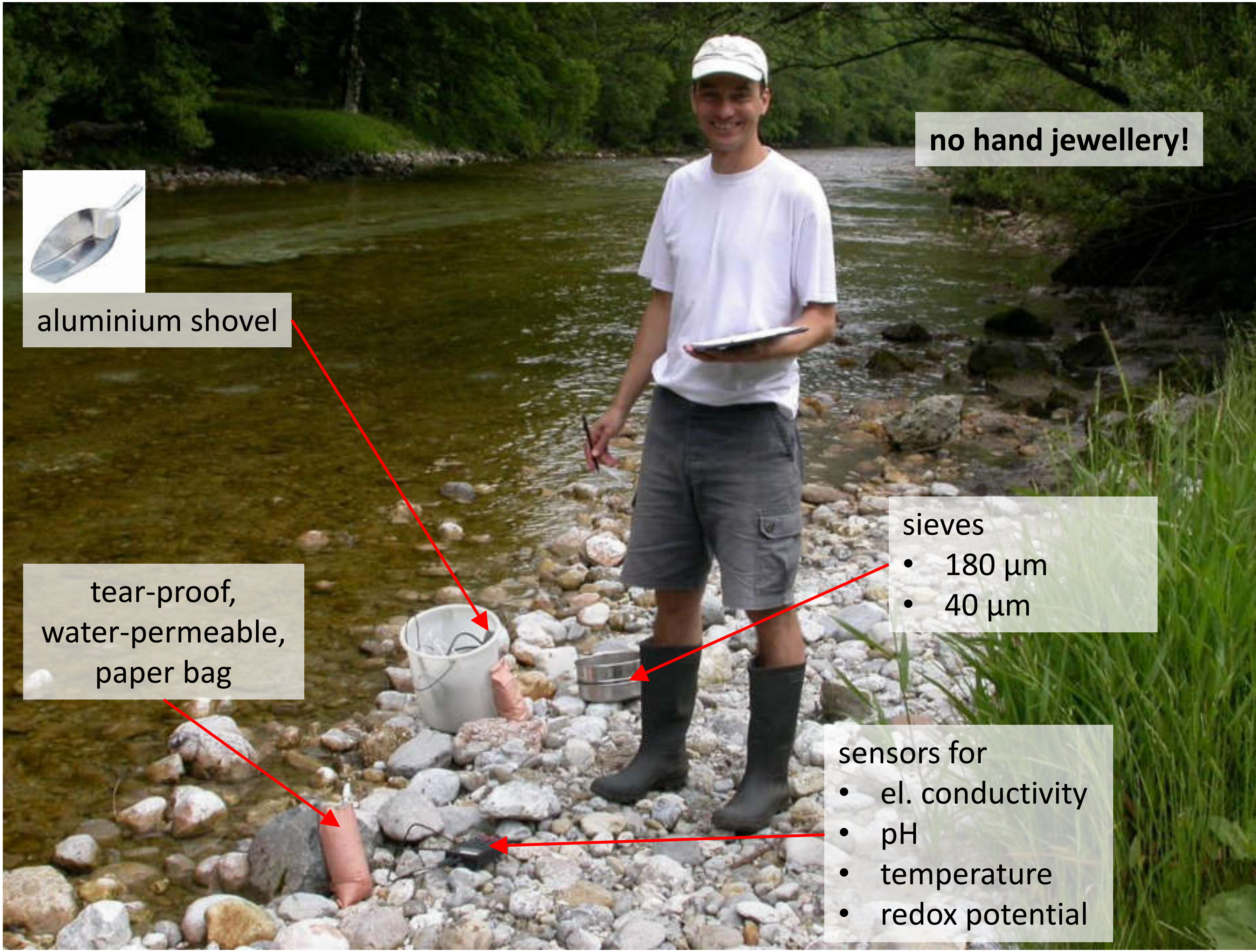
- for environmental monitoring
  in populated / industrial regions

Possible problems

- boulders
- river construction
- agriculture
- large, deep rivers
- slope failures

➢ adapt sampling sites

2. Sampling equipment



3. Sampling procedure

- 1 – 1.5 kg of **active** sediment (fine- to medium grained bed load material transported by running water)
- if necessary collect material over a stretch of 50 m up-/downstream of sampling point
- 2 grain size fractions:
  - sand/silt (180 µm)
  - silt/clay (40 µm)
- if necessary wet sieving
- in situ measurements of
  - air temperature
  - in stream water: temperature, electrical conductivity, pH, Eh
  - in sediment (in bag before decanting): temperature, el. conductivity, pH, Eh (comparison allows to test if sediment is active)
- **not** during / after heavy rain events or high floods!
- duplicate sampling for quality control every 50th sample

4. Sample preparation in the field

- dewatering in dry storage rooms

in the field lab / at home:

- weighing of total sample
- drying in oven at < 110°C → water content (Austrian Standard ÖNORM B 4410)
- sieving < 180 µm (German Standard DIN 4188)
- weighing of samples after drying & sieving

5. Sampling documentation

- **General data**: person, sample number, location (name of village / area on topographical map), coordinates, coordinate system, altitude, date & time, weather, name of river, reasons for sampling site adaptation, duplicate sample for quality control (y/n)

- **Outcrop description**: sketch, photo, dry river bed (y/n), river constructions, dams, influence of industrial /residential sites, traffic routes, mining activities, waste, sewage etc.

- **Sample description**: grain size fraction, in-situ measurements, measurement devices, visible iron or manganese oxide precipitations

- **Description of in situ sample preparation**: drying, weighing, sieving; total sample weight, water content, sample weight after drying and sieving

Interreg
Danube Transnational Programme
DanubeSediment

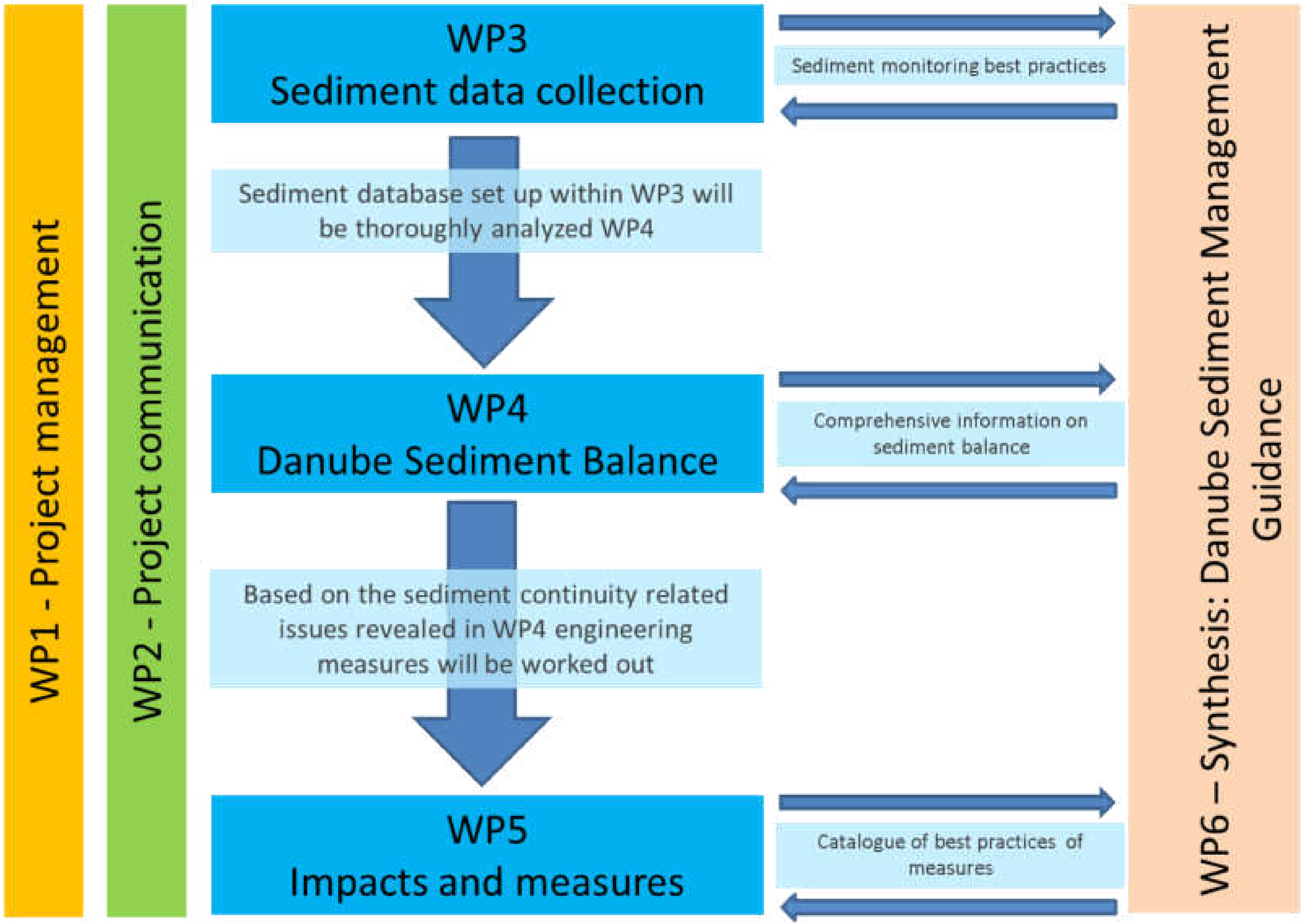
Sediment sampling in large rivers
DanubeSediment project

Introduction of applied sediment monitoring methods along the Danube

Barbara Kéri and Sándor Baranya, BME

Vienna, 10.04.2019

Project methodology

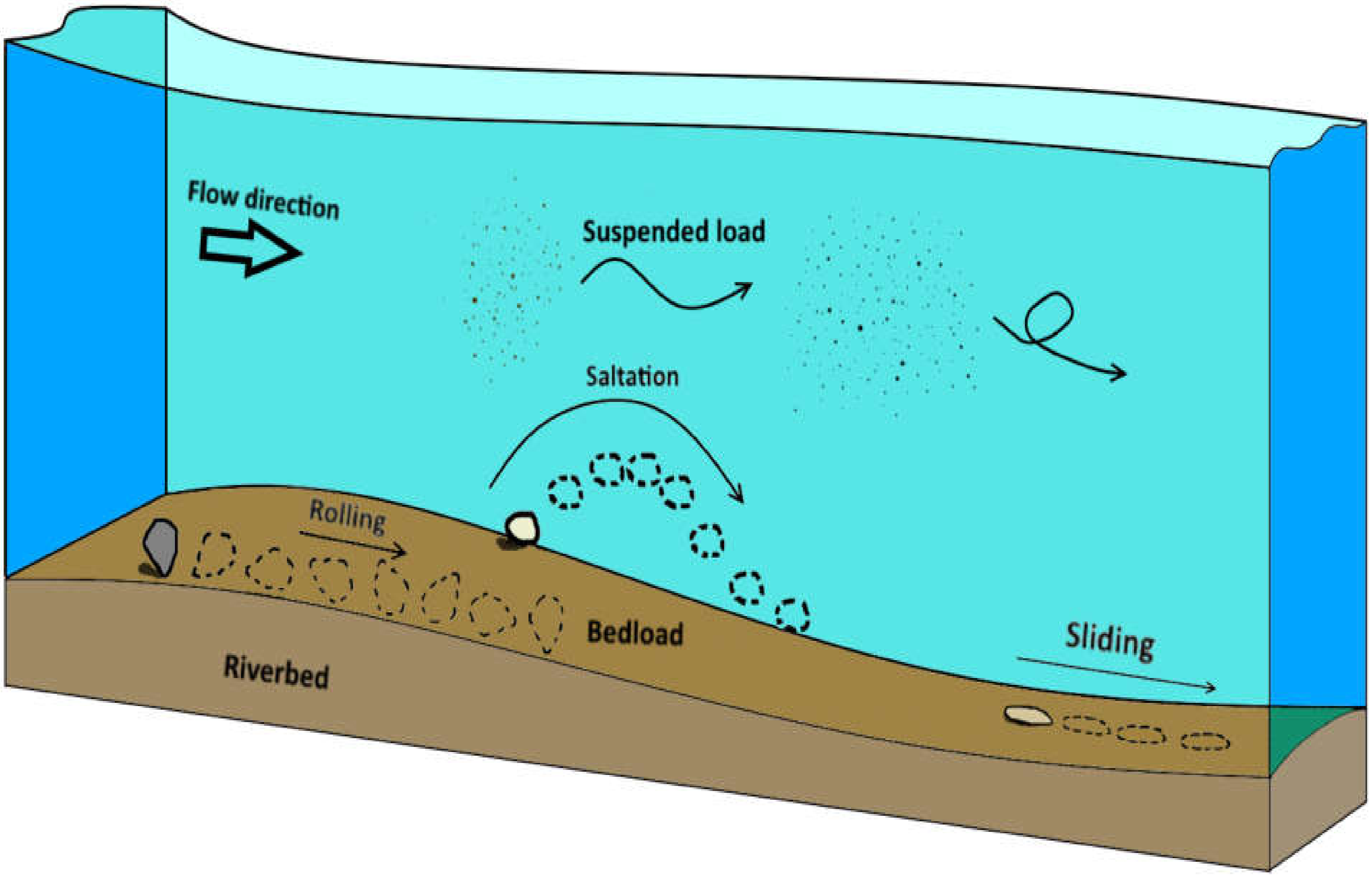


WP3: Sediment Data Collection

Objectives

- Reveal all available sediment data for the Danube and the major selected tributaries at the confluence
- Permanent interaction with the data owner stakeholders (water directorates, private companies, Project Partners)
- Limited sediment transport monitoring at short reaches with significant data gaps
- Comparative analysis and intercalibration of different sediment monitoring techniques
- Recommendations for the good practices of sediment monitoring techniques
- Training of sediment experts on an international workshop

Transport modes of sediments in rivers



Sediment monitoring system along the Danube and at the most important tributaries

Collection of metadata

- Web based questionnaire


Interreg
Danube Transnational Programme
DanubeSediment

DanubeSediment: Sediment monitoring spreadsheet

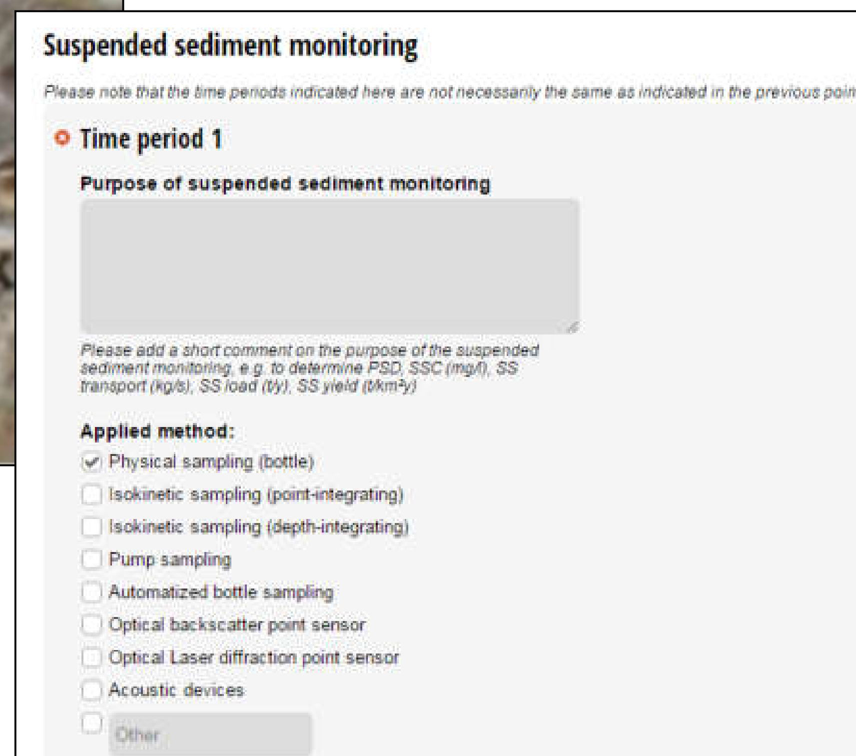
This spreadsheet provides relevant information about the sediment monitoring methods applied by the Danube countries in the Danube River and at the most significant tributaries (at the stations closest to the confluence). One questionnaire is to be filled in for each monitoring station.

Name of user:

Organization:

email address:

1. Basic information of the monitoring station


Suspended sediment monitoring

Please note that the time periods indicated here are not necessarily the same as indicated in the previous points

Time period 1

Purpose of suspended sediment monitoring

Please add a short comment on the purpose of the suspended sediment monitoring, e.g. to determine PSD, SSC (mg/l), SS transport (kg/s), SS load (t/y), SS yield (t/km²y)

Applied method:

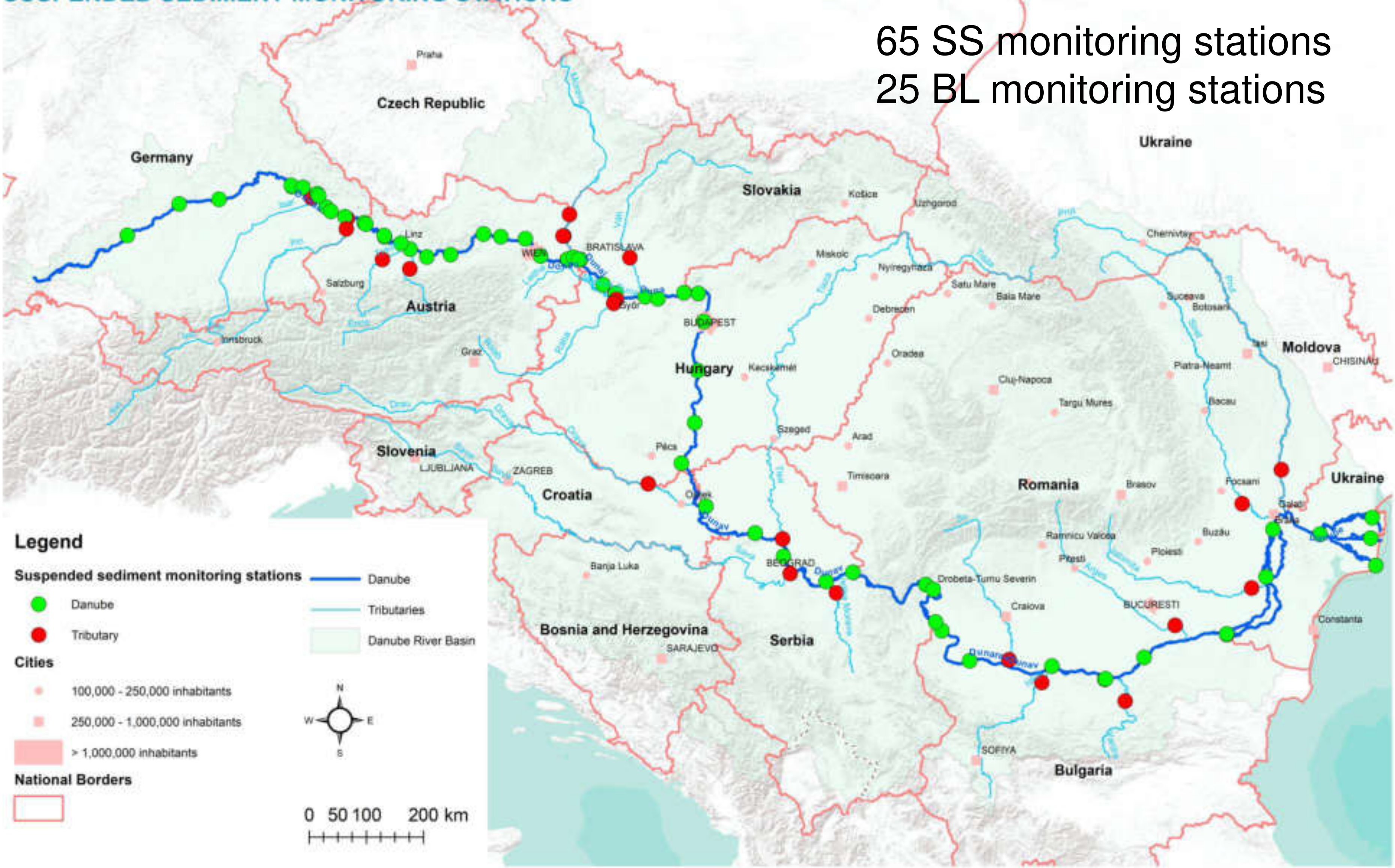
- [x] Physical sampling (bottle)
- [ ] Isokinetic sampling (point-integrating)
- [ ] Isokinetic sampling (depth-integrating)
- [ ] Pump sampling
- [ ] Automatized bottle sampling
- [ ] Optical backscatter point sensor
- [ ] Optical Laser diffraction point sensor
- [ ] Acoustic devices
- [ ] Other

Suspended sediment monitoring stations along the Danube and at the most important tributaries (closest to the confluence)

Map 1

SUSPENDED SEDIMENT MONITORING STATIONS

65 SS monitoring stations
25 BL monitoring stations



http://www.interreg-danube.eu/approved-projects/danubesediment

This map was produced in the frame of the EU funded project DanubeSediment, and is based on national information provided by Contracting Parties (AT, BG, DE, HR, HU, RO, RS, SK).

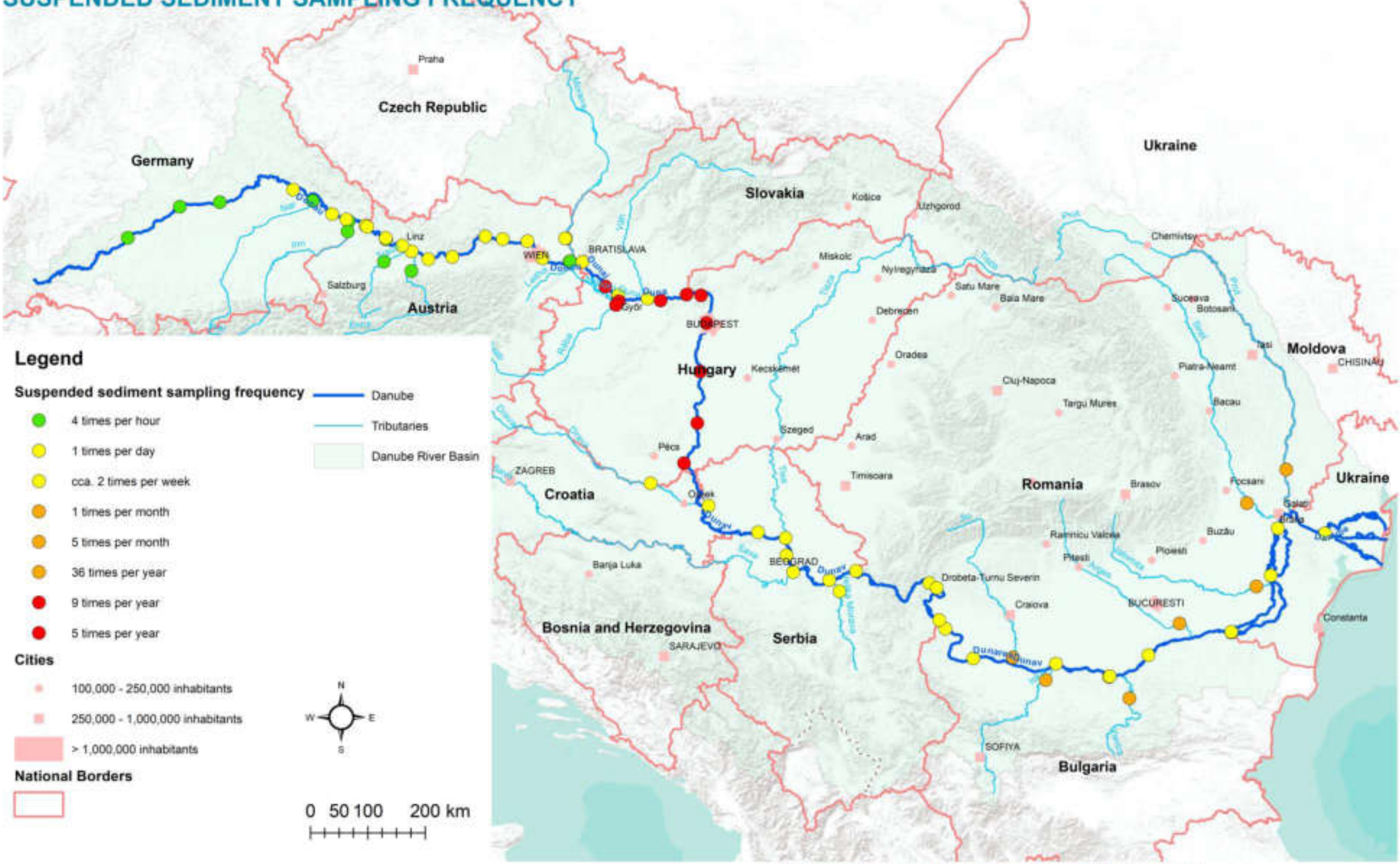
Budapest, April 2018

Interreg Danube Transnational Programme DanubeSediment

Suspended sediment monitoring stations along the Danube and at the most important tributaries (closest to the confluence)

Map 4

SUSPENDED SEDIMENT SAMPLING FREQUENCY



http://www.interreg-danube.eu/approved-projects/danubesediment

This map was produced in the frame of the EU funded project DanubeSediment, and is based on national information provided by Contracting Parties (AT, BG, DE, HR, HU, RO, RS, SK).

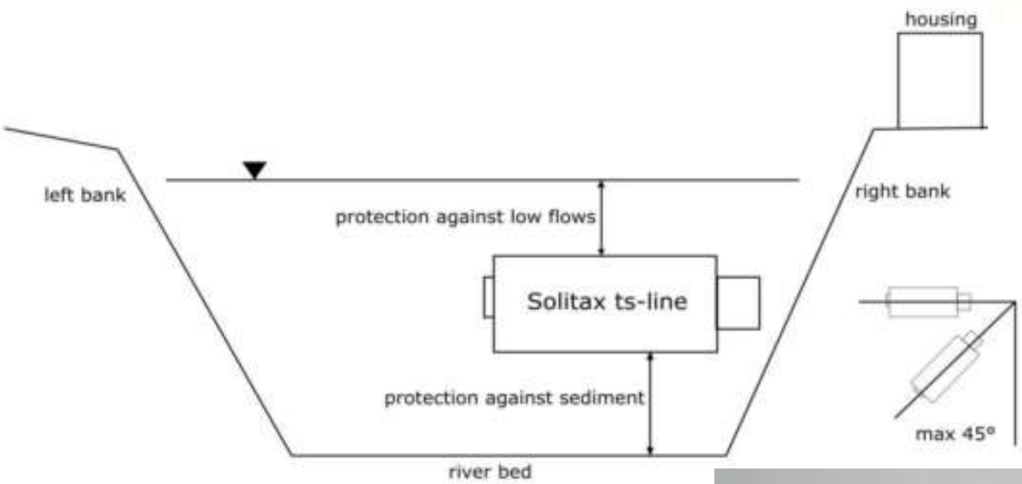
Budapest, April 2018

Interreg Danube Transnational Programme DanubeSediment

Suspended sediment monitoring in Germany

Interreg
Danube Transnational Programme
DanubeSediment

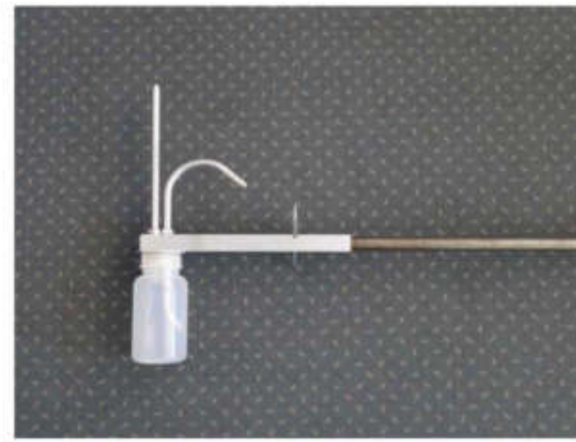
- Responsible institute: Bavarian Environment Agency (LfU), Bavarian Hydrological Service (GKD), Federal Waterways and Shipping Administration (WSV)
- Automatized monitoring using Optical Backscatter Sensors (OBS), physical sampling (bottle)
- Sampling frequency: 15 min
- Nr. of stations: 9 (2 trib.)



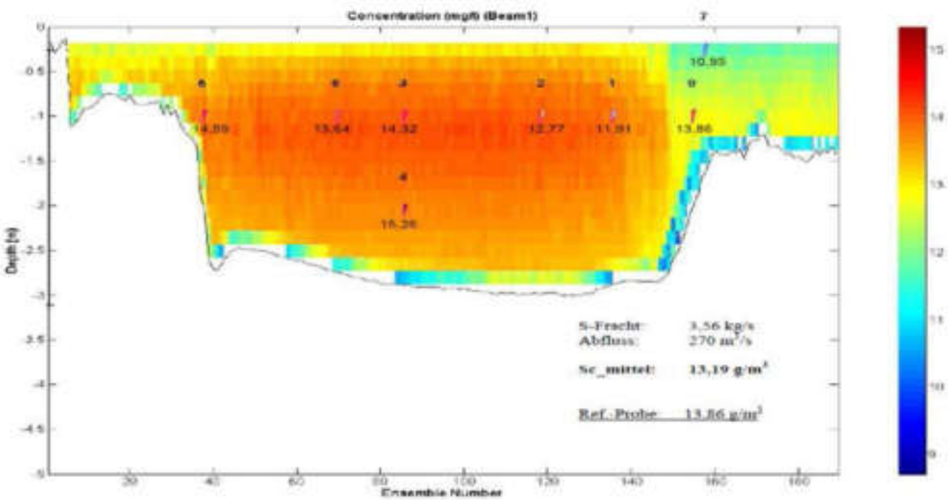
Solitax ts-line

Suspended sediment monitoring in Germany

- Calibration of OBS – point sampling at the sensor



- Multipoint sampling and
- Acoustic profiling:
  - StreamPro ADCP + ViSea
- SSC analysis method: filtering



Suspended sediment monitoring in Austria

- Responsible institute: ViaDonau, Verbund Hydro Power
- Automatized monitoring using Optical Backscatter Sensors (OBS), pump sampling, automatized bottle sampling
- Sampling frequency: 15 min
- Nr. of stations: 11 (4 trib.)

Suspended sediment monitoring in Austria

Interreg
Danube Transnational Programme
DanubeSediment

- Estimation of sediment load (Habersack et al., 2013):

Turbidity

Concentration close to the sensor

Mean concentration

Suspended sediment transport

Suspended sediment load

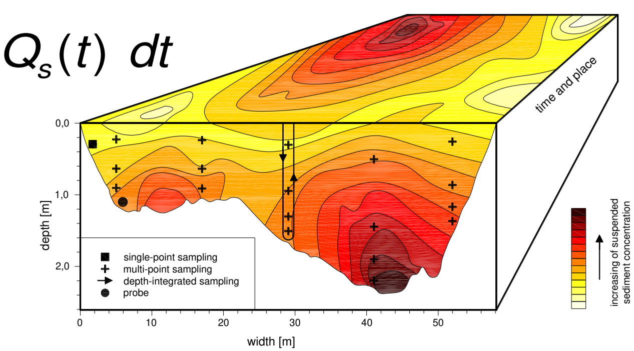
Probe characteristic $s_k = a\ s_s$

Probe factor $k_s = s_k / s_s$

Cross-sectional characteristic $s_m = a\ s_k$

Discharge $Q_s = s_m\ Q$

Time $V_s = \int_{t_1}^{t_2} Q_s(t)\ dt$



Suspended sediments vary in space and time

Suspended sediment monitoring in Austria

- Cross-sectional calibration – multipoint sampling

Suspended sediment monitoring in Austria

- Laboratory analysis of water samples
- SSC → vacuum filtration (0.45 µm filter), drying (2 hours on 105° C), weighing
- PSD → sieving instrument and sedimentation instrument

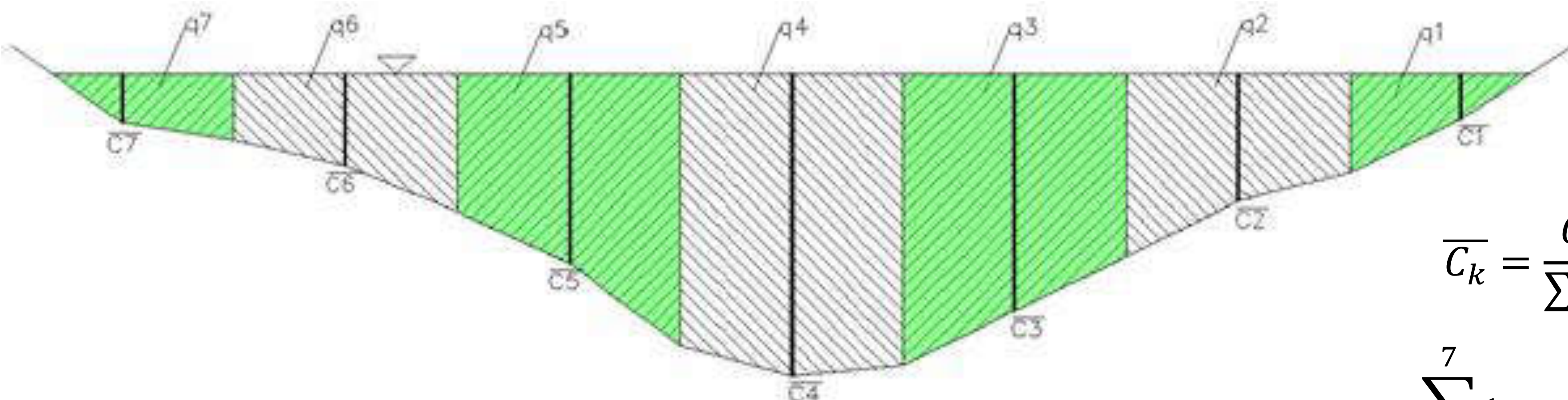
Suspended sediment monitoring in Slovakia

- Responsible institute: SHMU, VUVH
- Typical frequency: 3 to 20 times/week
- Depth-integrated sampling at representative verticals
- Nr. of stations: 5 (1 trib.)

- SSC → filtration of 0.2 l (0.45 µm filter), drying (24 hours on 105° C), weighing

Suspended sediment monitoring in Hungary

- Expeditionary multipoint measurements
- Typical frequency: 5 times/year
- 7 verticals, 10 points/vertical, 1 liter/point using pump
- 10x1 liter samples are integrated → sedimentation → extraction of 9 liters → remaining 1 liter is analysed → drying, weighing
- PSD → sedimentation instrument
- Nr. of stations: 7 (1 trib.)



$$\overline{C_k} = \frac{G_s}{\sum q_i}$$

$$G_s = \sum_{i=1}^{7} (q_i \cdot \overline{C_i})$$

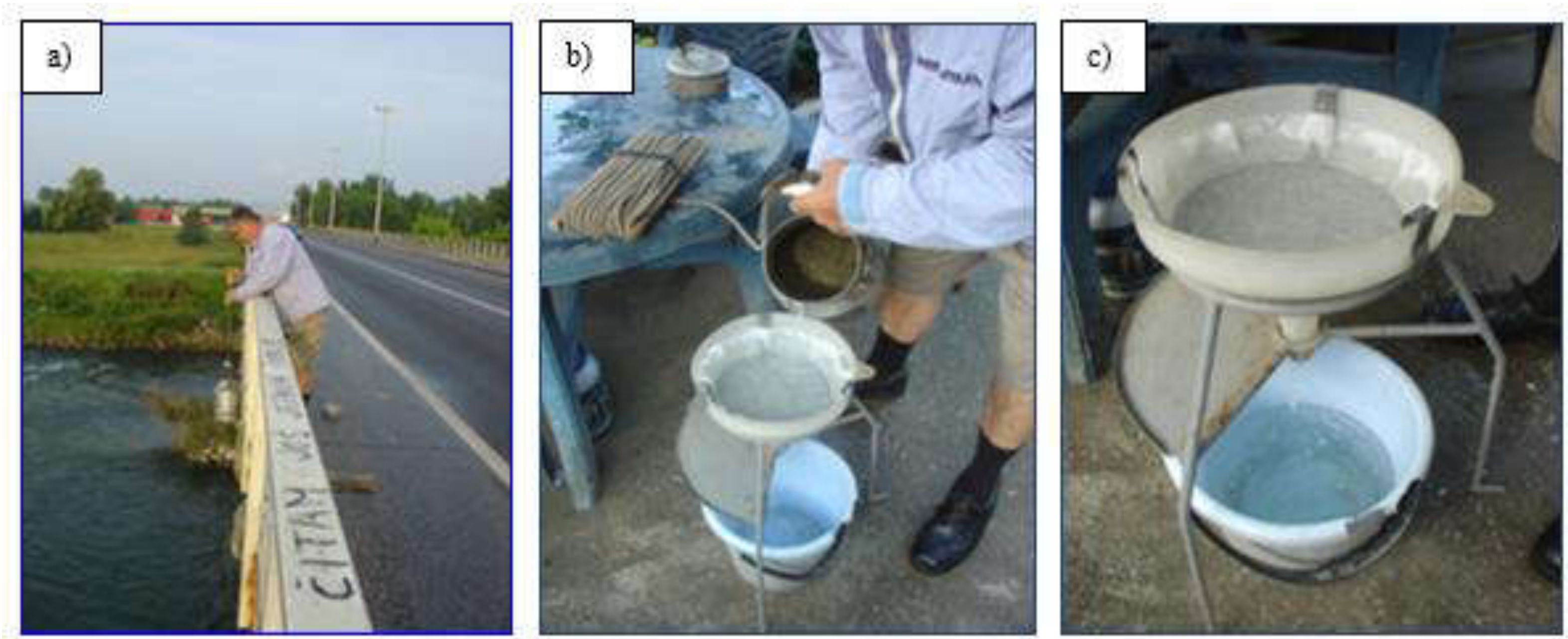
Suspended sediment monitoring in Hungary

- Pump sampler

- Estimation of SSL using sediment rating curves and actual discharge

Suspended sediment monitoring in Croatia

- Daily physical sampling in one point at the water surface using bucket sampler→ filtration (0.45 μm filter) → filters to laboratory, drying (on 105° C), weighing
- Multipoint measurements 6 times/year with pump
- Nr. of stations: 1 trib.

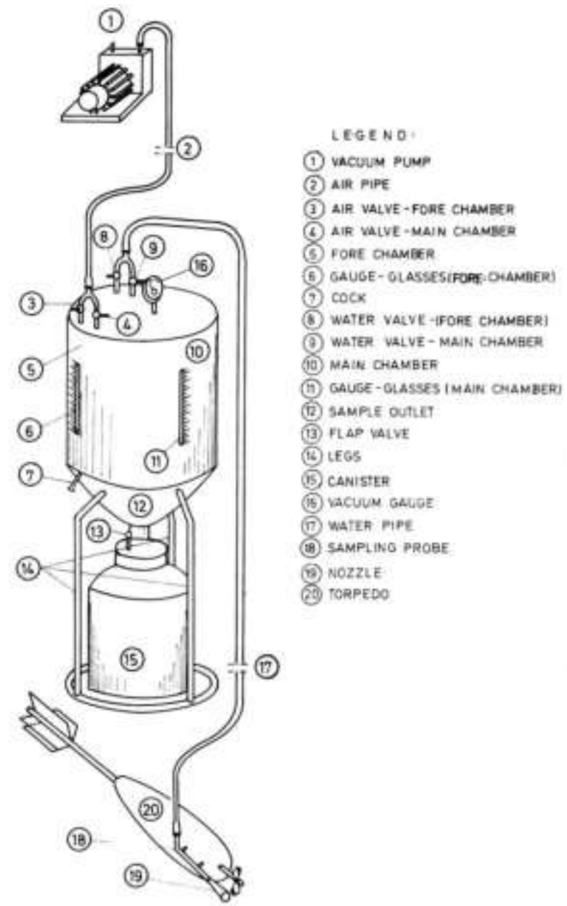


Suspended sediment monitoring in Serbia

- Daily physical sampling in one point at the water surface using bucket sampler (10 liters) → filtration (0.45 μm filter) → filters to laboratory, drying (on 105° C), weighing
- Multipoint measurements 1-3 times/year with vacuum bathometer in 7-10 verticals, 5 points/vertical, ~40 liter sample/point
- Estimation of SSL → Correlation between surface concentration and mean concentration along the cross-section
- Sedimentation of samples for days → 1-1.5 liter of concentrated sample is extracted → repeated settling for a day → 0.1 liter of concentrated sample is extracted → drying, weighing
- Nr. of stations: 7 (3 trib.)

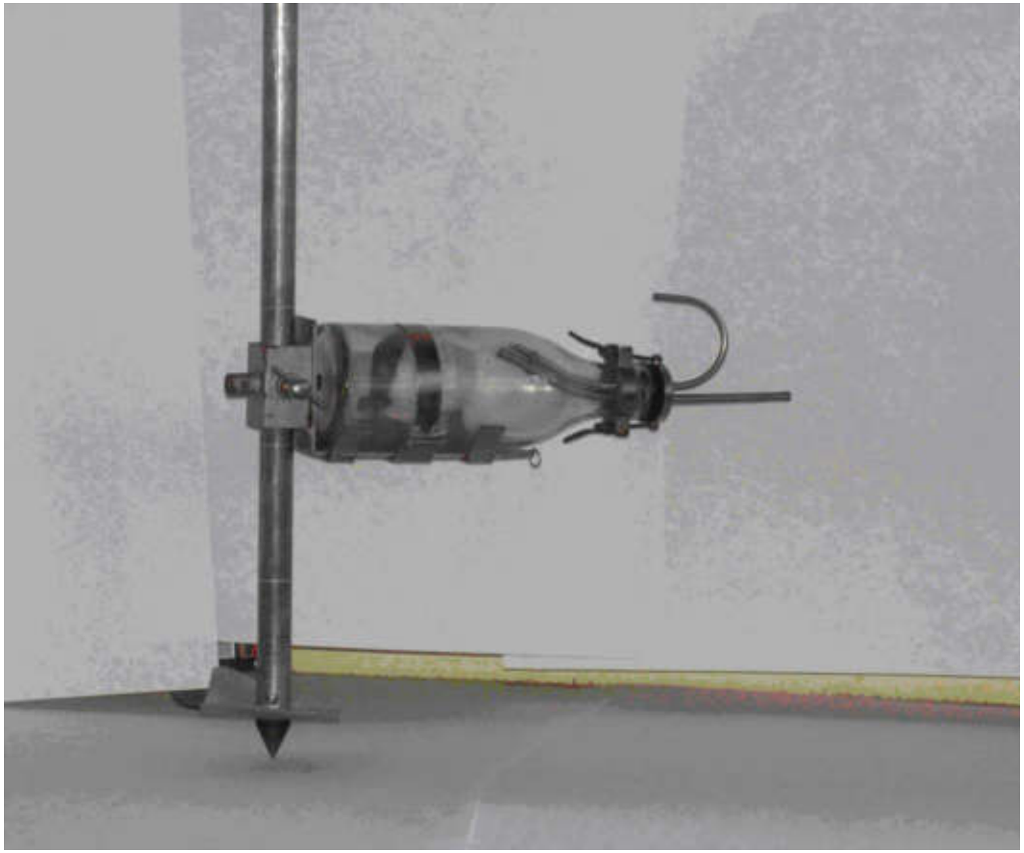
Suspended sediment monitoring in Serbia

- Daily physical sampling
- Multipoint measurements 4-6 times/year with bathometer in 5-9 verticals
- Correction of point samples with cross-section calibration
  $\rightarrow$ daily sediment discharge



Suspended sediment monitoring in Bulgaria

- Daily physical sampling with bottle sampler at the river bank
- Mean concentration in the cross-section is assumed to be the measured one at the river bank
  → daily sediment discharge
- Nr. of stations: 6 (2 trib.)



Suspended sediment monitoring in Romania

- Daily physical sampling with bottle sampler at the river bank
- Multipoint measurements 4-6 times/year with bathometer in 5-9 verticals
- SSC is determined using a portable turbidity sensor
- Nr. of stations: 19 (5 trib.)

Suspended sediment monitoring stations along the Danube and at the most important tributaries (closest to the confluence)

Map 3

SUSPENDED SEDIMENT ANALYSIS METHODS

http://www.interreg-danube.eu/approved-projects/danubesediment

This map was produced in the frame of the EU funded project DanubeSediment, and is based on national information provided by Contracting Parties (AT, BG, DE, HR, HU, RO, RS, SK).

Budapest, April 2018

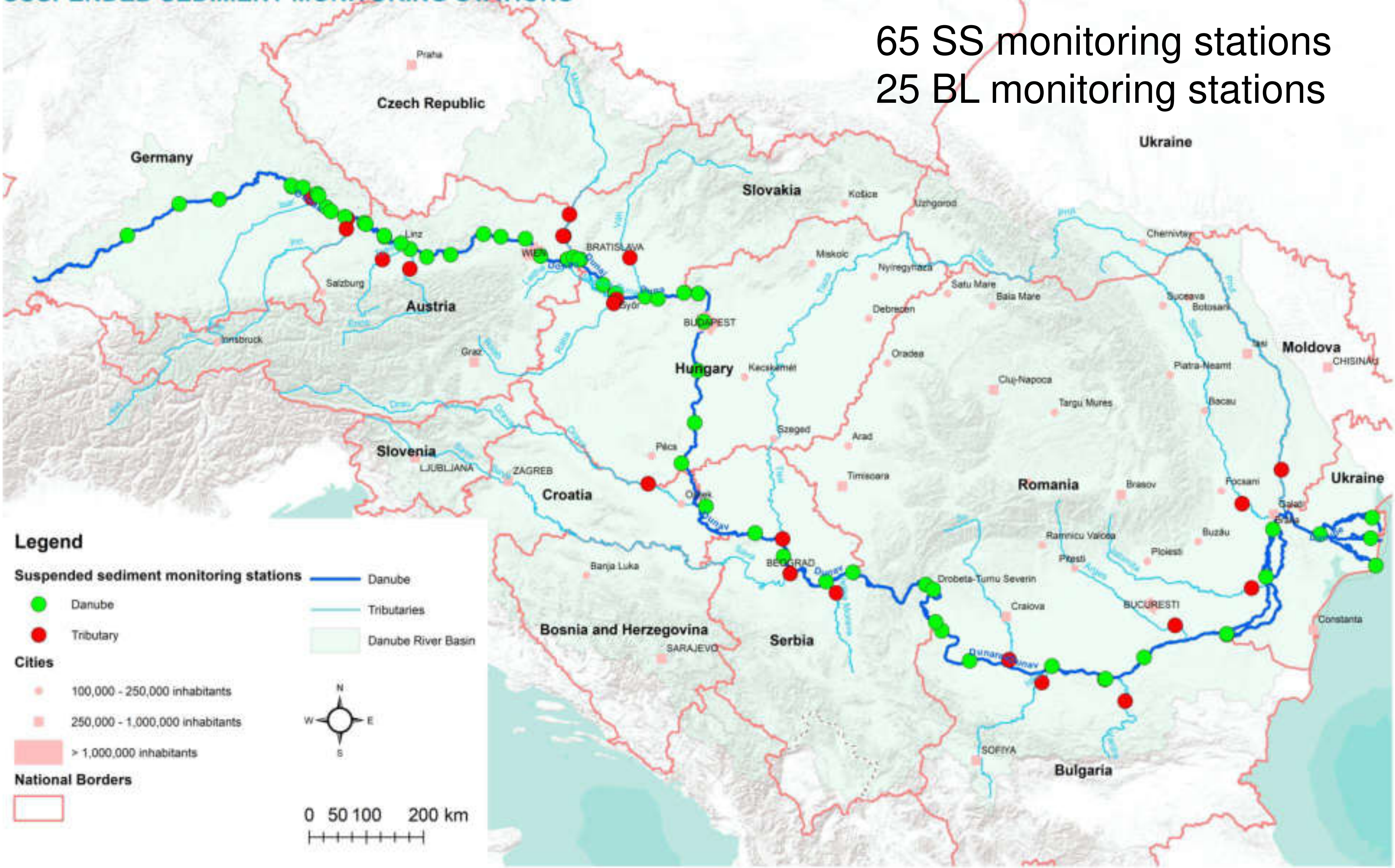
Interreg Danube Transnational Programme DanubeSediment

Suspended sediment monitoring stations along the Danube and at the most important tributaries (closest to the confluence)

Map 1

SUSPENDED SEDIMENT MONITORING STATIONS

65 SS monitoring stations
25 BL monitoring stations



http://www.interreg-danube.eu/approved-projects/danubesediment

This map was produced in the frame of the EU funded project DanubeSediment, and is based on national information provided by Contracting Parties (AT, BG, DE, HR, HU, RO, RS, SK).

Budapest, April 2018

Bedload monitoring stations along the Danube and at the most important tributaries (closest to the confluence)

Map 2

BEDLOAD MONITORING STATIONS

http://www.interreg-danube.eu/approved-projects/danubesediment

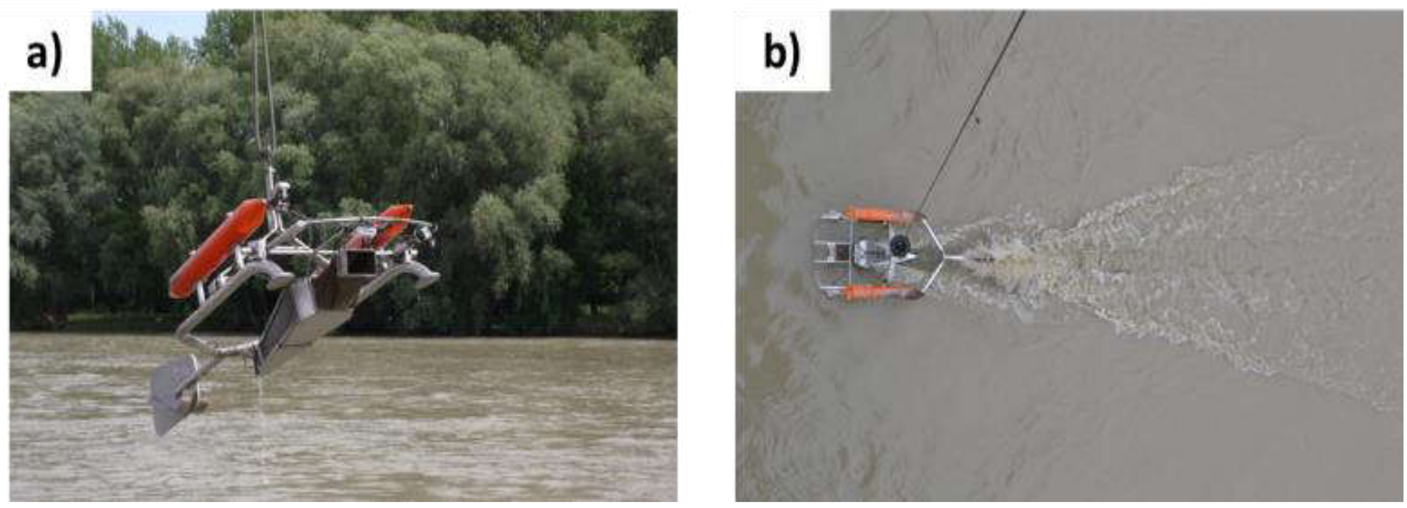
This map was produced in the frame of the EU funded project DanubeSediment, and is based on national information provided by Contracting Parties (AT, BG, DE, HR, HU, RO, RS, SK).

Budapest, April 2018

Interreg Danube Transnational Programme DanubeSediment

Bedload monitoring

- Germany: expeditionary monitoring campaigns at 9 sites
  - BfG sampler
  - Sampling from ship
  - Rating curves
- Austria (1 station):
  - BfG sampler (monitoring at Bad-Deutsch Altenburg)
  - Mesh size: 1 mm
  - Sampling from bridge or from ship
  - 8-15 verticals, 3x5 minute long samplings
  - 3 times/year
  - Drying, sieving



Bedload monitoring

- Slovakia (2+1 stations):
  - intensive measurement campaigns in 1997-1998 and 2002-2003
  - Swiss-type sampler, 5-6 verticals
  - 2-5 min long samplings
  - Drying, sieving of the samples
  - Rating curves have been set up

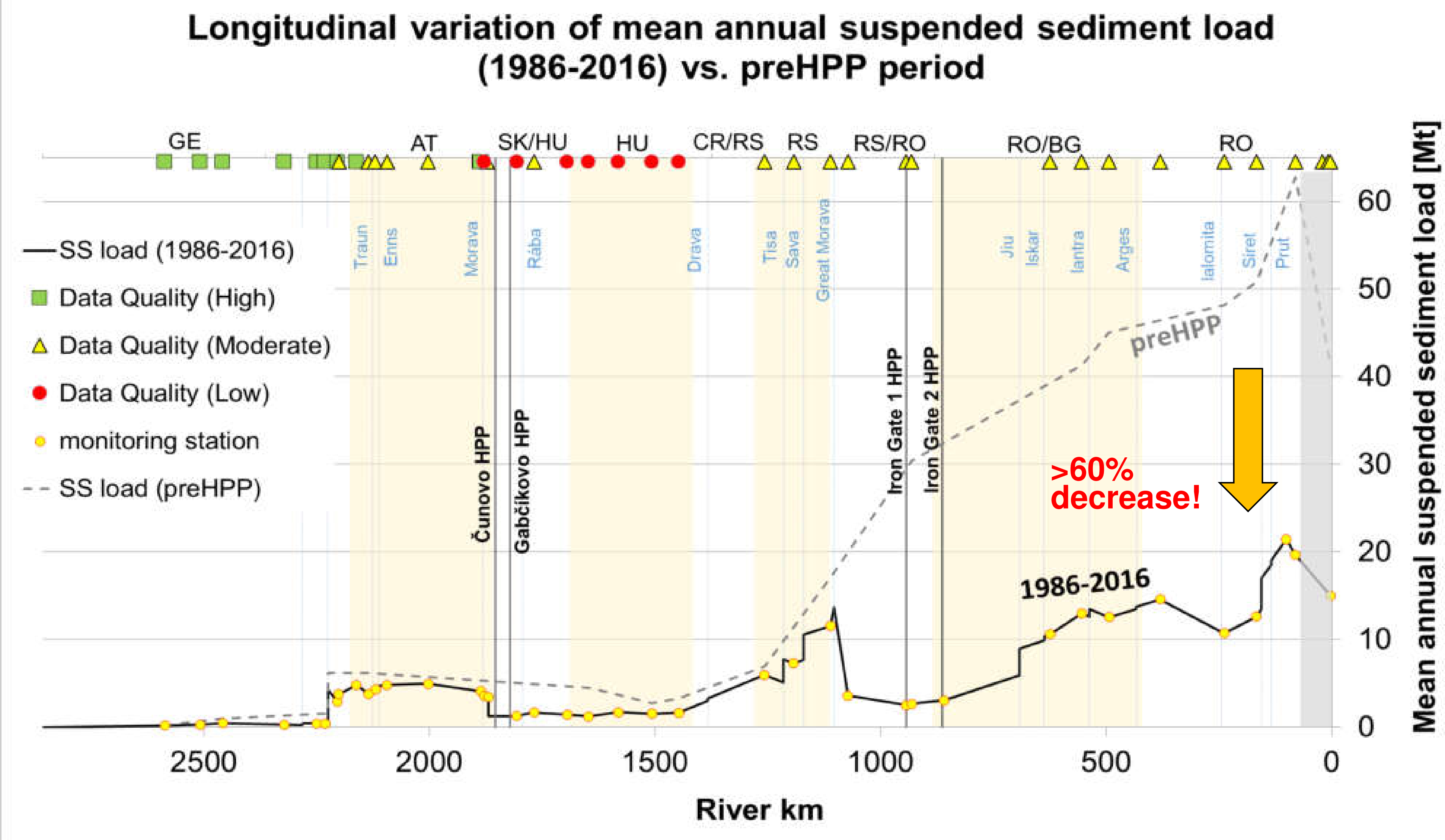

Bedload monitoring

- Hungary (1 station):
  - continuous monitoring since 1998 at Vámosszabadi (Medvedov)
  - 4-6 times/year using the modified Károlyi-sampler at 7 verticals
  - 15 min long samplings
  - Drying, sieving of samples

Bedload monitoring

- Romania (11 stations):
  - 4-6 times/year at 11 monitoring stations, 5-9 verticals
  - ~10 min long samplings
  - Drying, sieving (0.063-50 mm)

Longitudinal variation of long-term (1986-2016) mean annual suspended sediment load along the Danube River



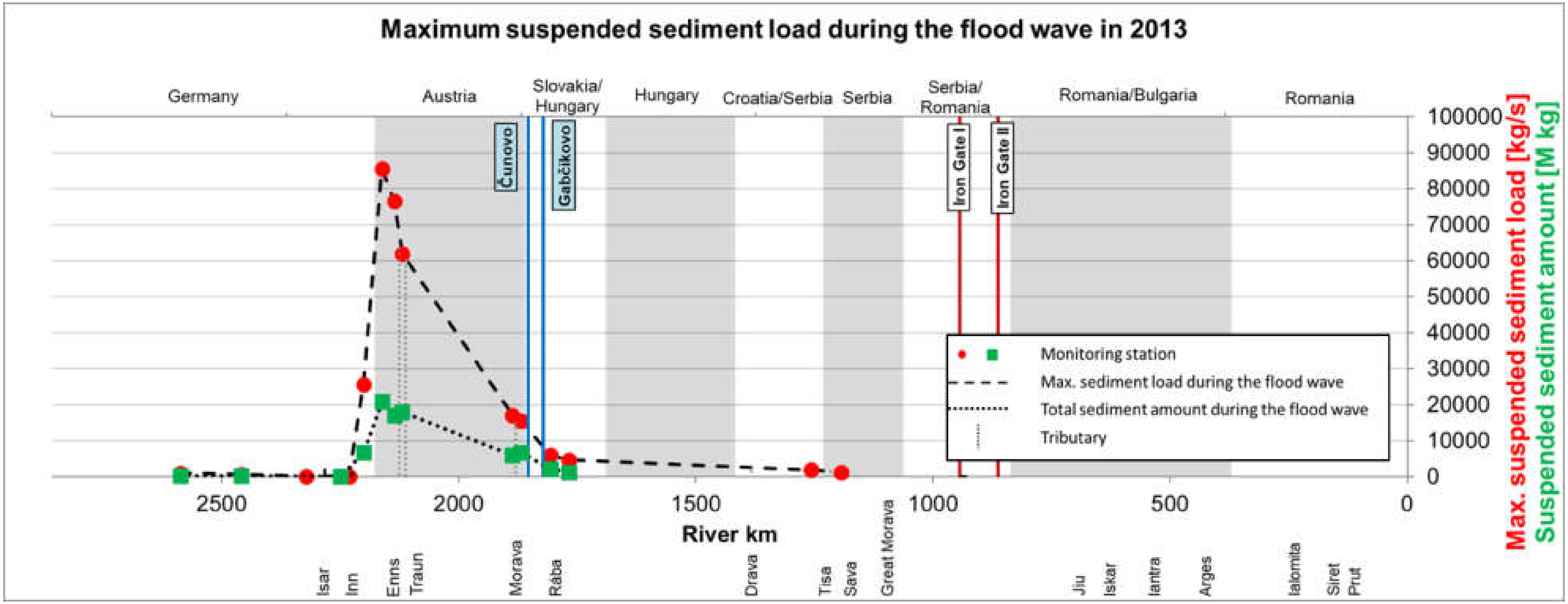
Thank you for your attention!

- Barbara Kéri
- keri.barbara@epito.bme.hu
- +36 30 275 2655

WP3: Sediment Data Collection

Activity 3.3 – Assessment of sediment data

Influence of floods on SS transport

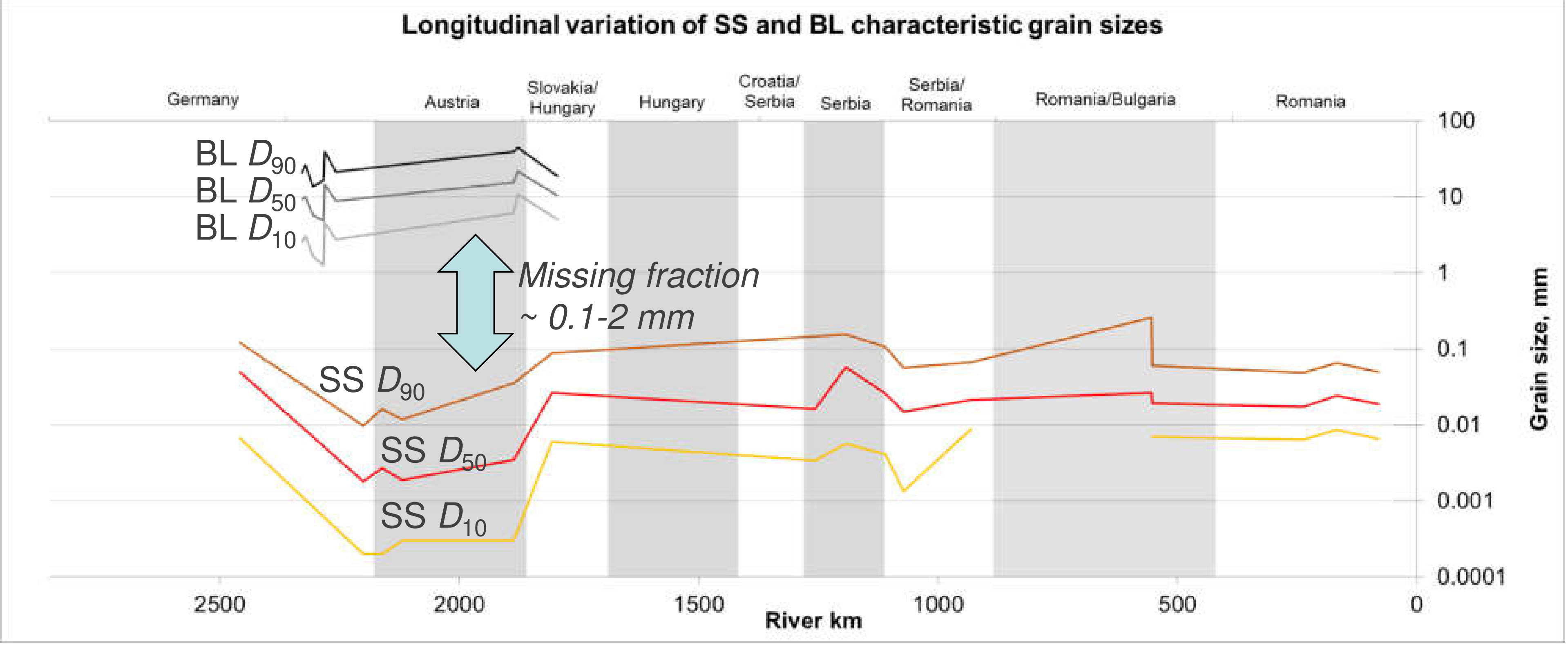


- 20M tons mobilized in AT (mean annual around 5Mt)

WP3: Sediment Data Collection

Activity 3.3 – Assessment of sediment data

Longitudinal variation of characteristic sediment grain sizes

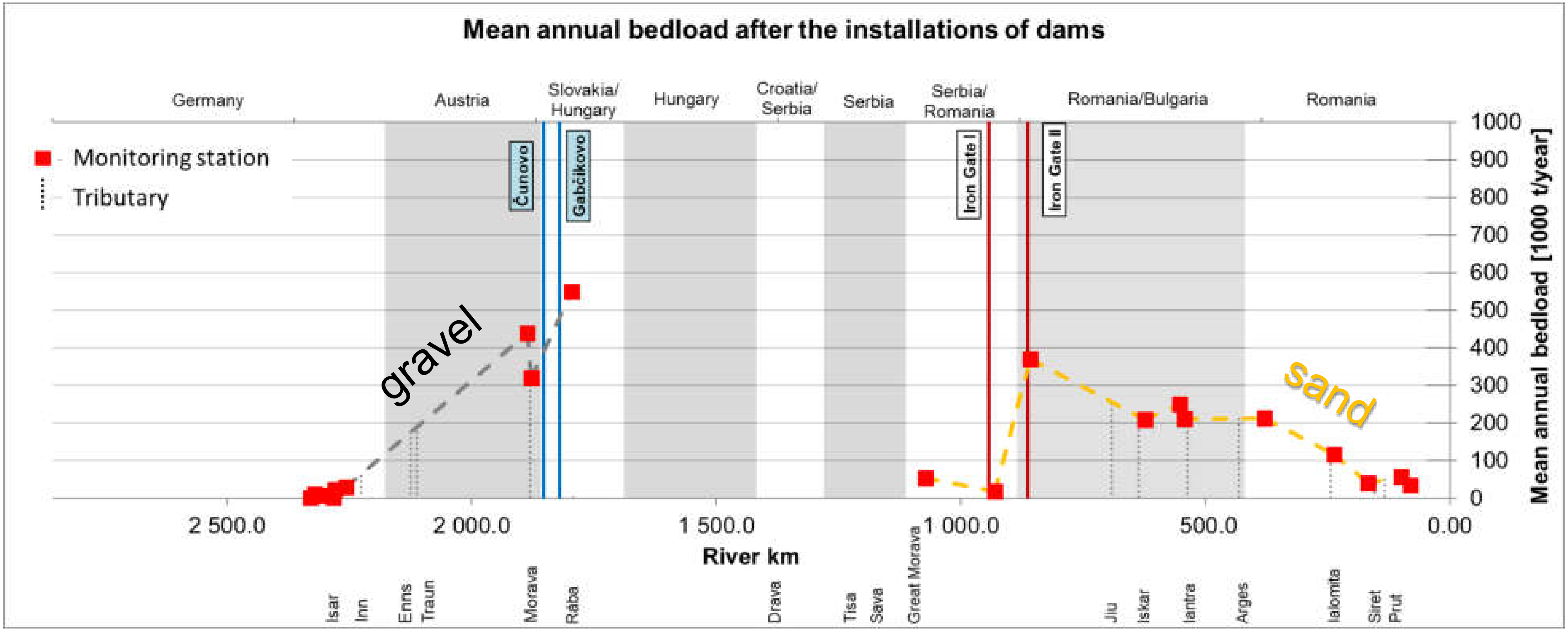


WP3: Sediment Data Collection

Interreg Danube Transnational Programme DanubeSediment

Activity 3.3 – Assessment of sediment data

Bedload transport

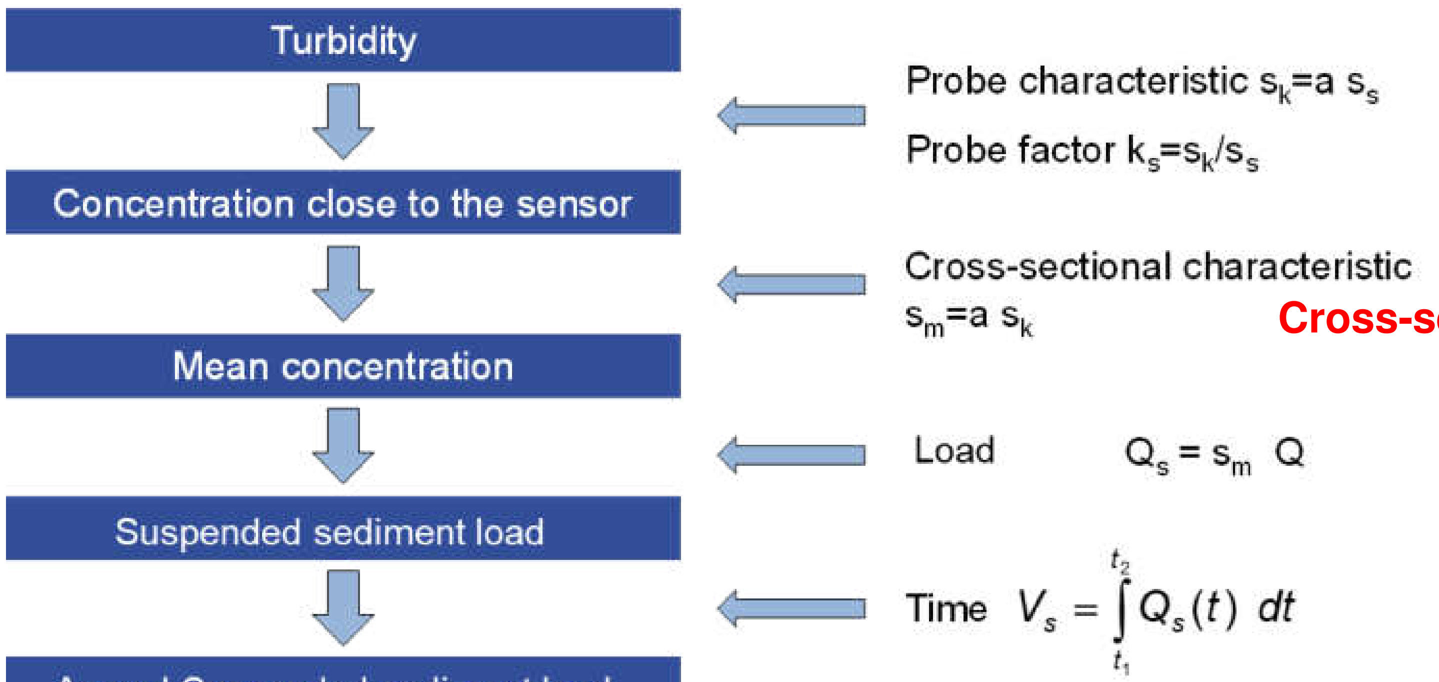


WP3: Sediment Data Collection

Activity 3.2 – Comparative analysis

Good practices in SS monitoring

Methodology



Sensor calibration

Cross-sectional calibration

WP3: Sediment Data Collection

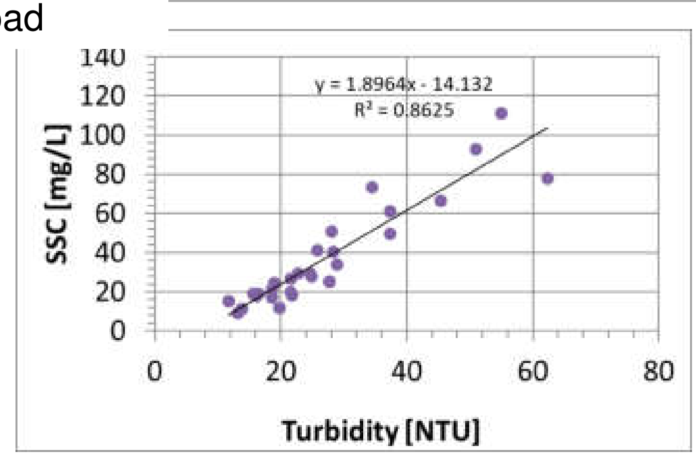
Activity 3.2 – Comparative analysis

Good practices in SS monitoring

Sensor calibration

Turbidity
↓
Concentration close to the sensor
↓
Mean concentration
↓
Suspended sediment load
↓
Annual Suspended sediment load

Load



WP3: Sediment Data Collection

Activity 3.2 – Comparative analysis

Good practices in SS monitoring

Cross-sectional calibration (isokinetic sampling!)

Turbidity

↓

Concentration close to the sensor

↓

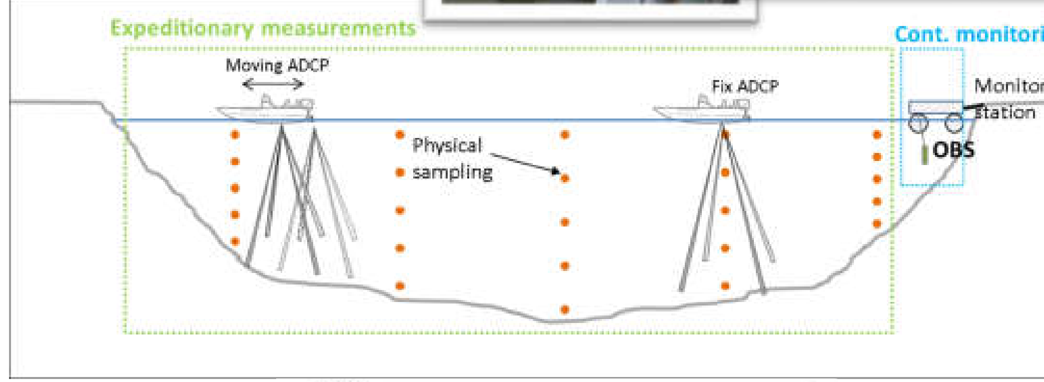
Mean concentration

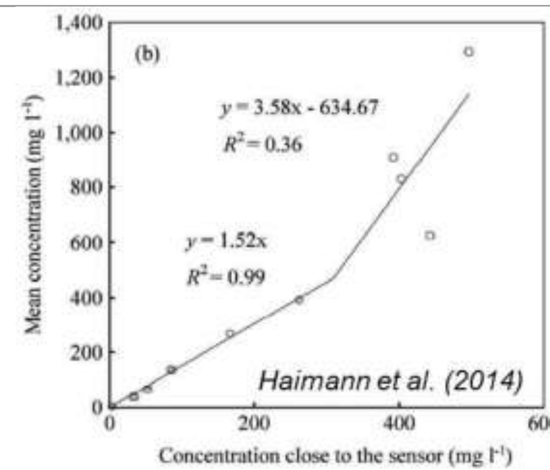
↓

Suspended sediment load

↓

Annual Suspended sediment load



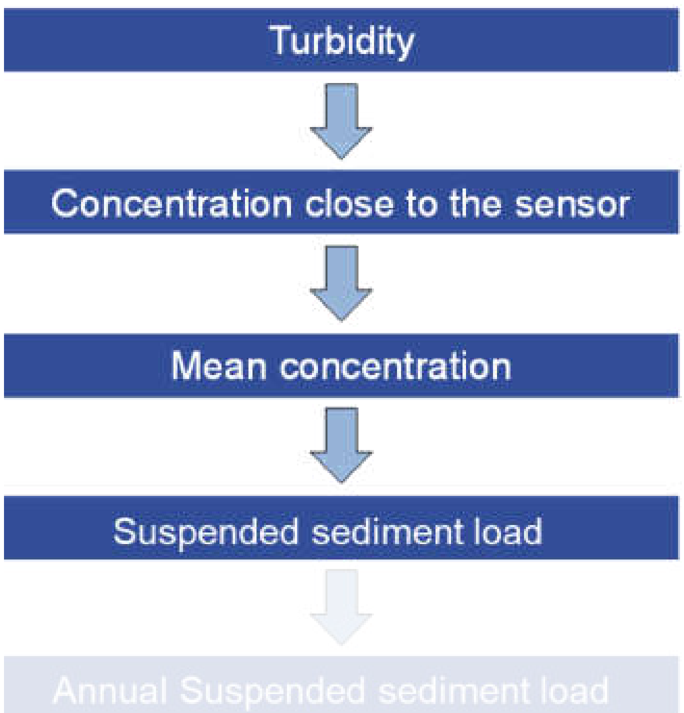


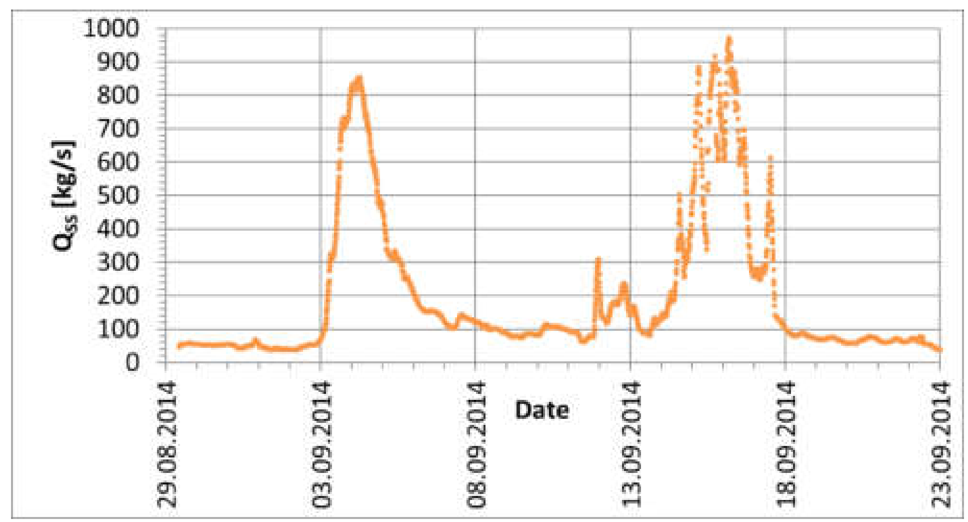
WP3: Sediment Data Collection

Activity 3.2 – Comparative analysis

Good practices in SS monitoring

Temporal variation of SS load



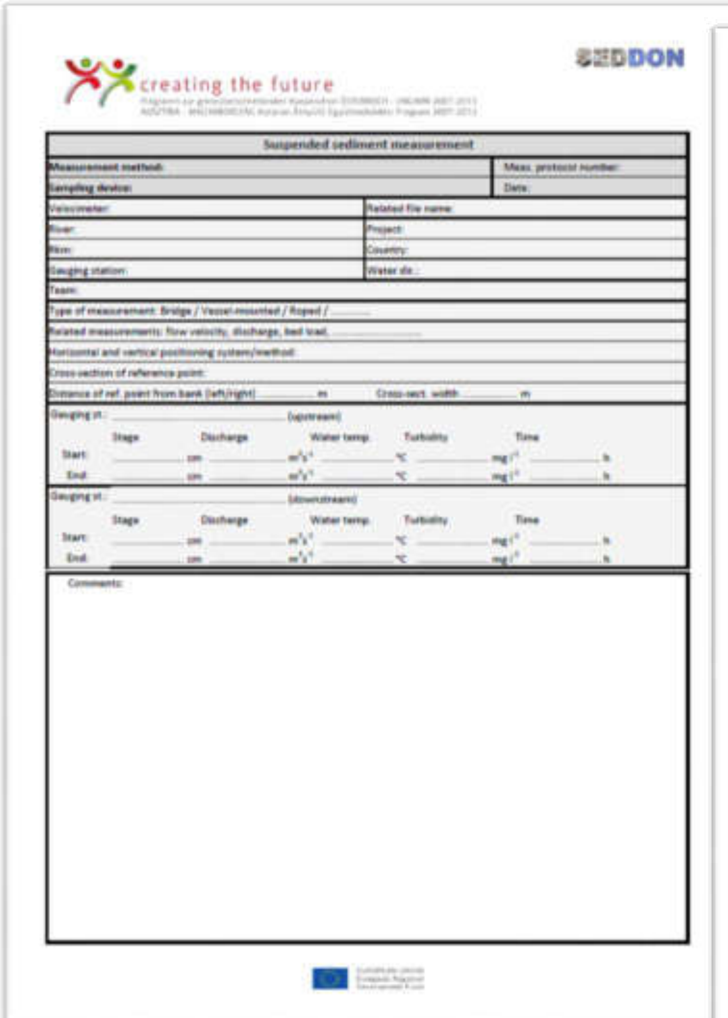


WP3: Sediment Data Collection

Activity 3.2 – Comparative analysis

Good practices in SS monitoring

Protocols



creating the future

SEDDON

Suspended sediment measurement	
Measurement method:	Meas. protocol number:
Sampling device:	Date:
Velocimeter:	Related file name:
River:	Project:
Rkm:	Country:
Gauging station:	Water dir.:
Team:	
Type of measurement: Bridge / Vessel-mounted / Roped / ______	
Related measurements: flow velocity, discharge, bed load, ______	
Horizontal and vertical positioning system/method:	
Cross-section of reference point:	
Distance of ref. point from bank (left/right) ______ m	Cross-sect. width ______ m

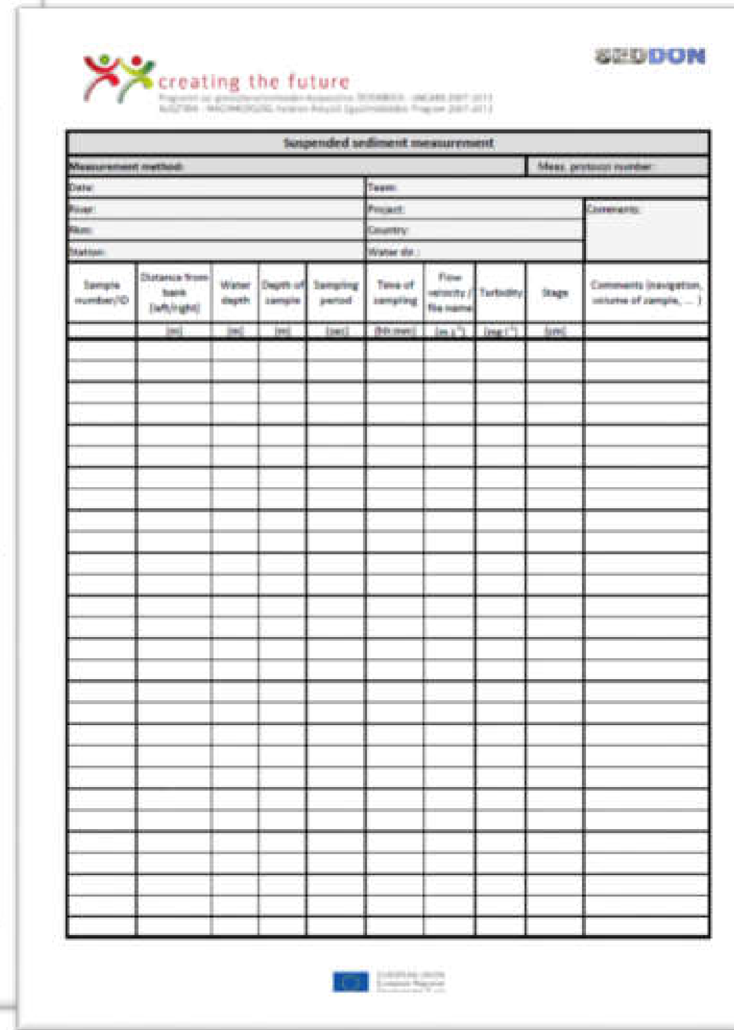
Gauging st.: ______ (upstream)

	Stage	Discharge	Water temp.	Turbidity	Time
Start	______ cm	______ m^3s^{-1}	______ °C	______ $mg\,l^{-1}$	______ h
End	______ cm	______ m^3s^{-1}	______ °C	______ $mg\,l^{-1}$	______ h

Gauging st.: ______ (downstream)

	Stage	Discharge	Water temp.	Turbidity	Time
Start	______ cm	______ m^3s^{-1}	______ °C	______ $mg\,l^{-1}$	______ h
End	______ cm	______ m^3s^{-1}	______ °C	______ $mg\,l^{-1}$	______ h

Comments:



creating the future

SEDDON

Suspended sediment measurement		
Measurement method:		Meas. protocol number:
Date:	Team:	
River:	Project:	Comments:
Rkm:	Country:	
Station:	Water dir.:	

Sample number/ID	Distance from bank (left/right)	Water depth	Depth of sample	Sampling period	Time of sampling	Flow velocity / file name	Turbidity	Stage	Comments (navigation, volume of sample, ...)
	[m]	[m]	[m]	[sec]	[hh:mm]	[m s⁻¹]	[mg l⁻¹]	[cm]	

WP3: Sediment Data Collection

Activity 3.2 – Comparative analysis

Good practices in SS monitoring

Laboratory analysis after BMLFUW (2008, 2017)

- Main steps:
  - Drying of membrane filter (of 0.45 µm pores) at 105° C until constant weight, after the drying the filter is placed in a desiccator, to let the filter cool down
  - Mass of the plate and filter is measured (m_a)
  - Membrane filter is placed into the filtering device.
  - Sample is poured into the filtering device and its volume is measured precisely (V_p).
  - After filtering, the membrane filter is dried at 105° C until constant weight, after the drying the filter is placed in a desiccator, to let the filter cool down
  - Plate and membrane filter is weighted again (m_b).
  - Dry matter content is: $m_T = m_b - m_a$ [mg].
  - SSC = m_T / V_p [mg/l].

BMLFUW (ed.) (2008): Schwebstoffe im Fließgewässer – Leitfaden zur Erfassung des Schwebstofftransportes. Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft, Austria, Vienna.

WP3: Sediment Data Collection

Activity 3.2 – Comparative analysis

Good practices in BL monitoring

Methodology

Sample weight and sampling time

↓

Transport rate for each sample

↓

Transport rate for a vertical

↓

Cross-sectional bedload transport

↓

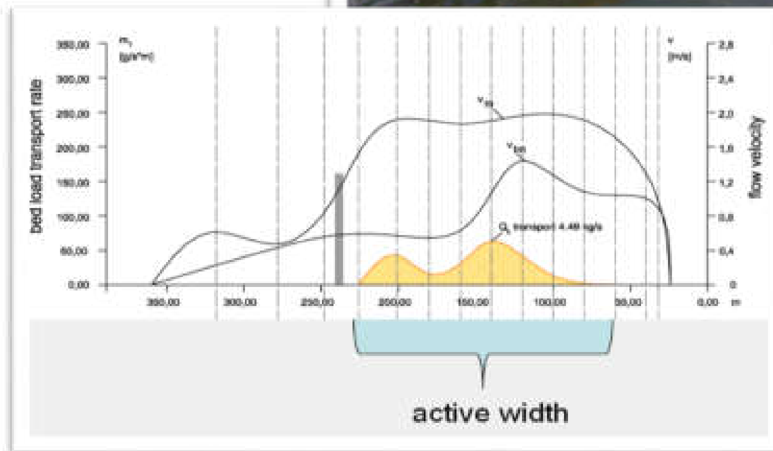
Bedload yield

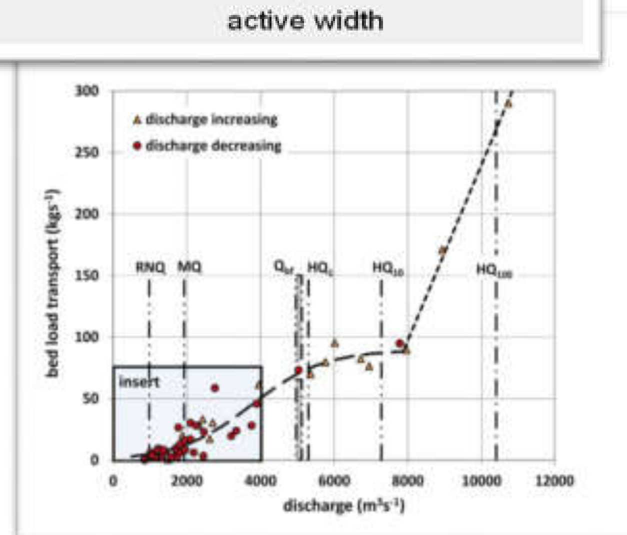
Calibration coefficient
Sampler width

Average samples
of one vertical

Integrate over the
active width

Integrate over time:
Bed load – discharge relation
(rating curve)
And Discharge





Interreg
Danube Transnational Programme
SIMONA

SIMONA Sampling WG presentation

Sampling WG leader: Ajka Šorša, asorsa@hgi-cgs.hr; ajkasorsa@gmail.com
HR HGI-CGS, Croatian Geological Survey

Inventory Workshop of the SIMONA Project
10th – 11th April, 2019, Vienna

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

WGs

Dr. sc. Gyozo Jordan, Szent Istvan University, Hungary, **Scientific Coordinator**:

The Sampling and the Laboratory WG

EXAMPLE

critically review the existing water and sediment national methods, the state-of-the-art knowledgebase, good practices and experiences in the DTP countries, including EU and non-EU countries.

Reviewing will be done against the following **criteria**: the developed protocols

(1) should be acceptable in all DTP countries,
(2) should be in-line with the ICPDR and the EU requirements,
(3) use the latest scientific knowledge, and
(4) have to be sustainable.

The **main steps** of reviewing the sampling and laboratory methods are

(1) reviewing national spatial and temporal sampling and monitoring techniques and laboratory analysis procedures for sediment quality measurements of the water phase, biota, bottom sediment, suspended sediment, floodplain sediment with passive and other sampling technics under the WFD implementation requirements;
(2) reviewing national uncertainty analysis techniques for sampling and laboratory analysis including representativity assessment; and (3) providing a critical summary and conclusions of the reviews.

Sampling WG

Based on WP3 Questionnaires - Danijel's WORK PLAN for WP4 - Activity 4.1

Activity 1 – Review

February 2019 - March 2019

Sampling

HR-HGI-CGS (Croatian Geological Survey) - sampling strategy;

RS-JCI (Institute for Development of Water Resources "Jaroslav Černi") - bottom sediment sampling procedures;

AT-GBA (Geological Survey of Austria) - suspended sediment sampling procedures;

SI-GEOZS (Geological Survey of Slovenia) - floodplain sediment sampling procedures;

Sampling WG

Danijel’s WORK PLAN for WP4 - Activity 4.1

Sampling

BA-FZG (Geological Survey of Federation of Bosnia and Herzegovina) - transport and storage of sediment samples;

HU-BME (Budapest University of Technology and Economics) - sediment sampling methods related to DTP DanubeSediment project on sediment quantity;

MD-IGS-ASM (Institute of Ecology and geography of the Academy of Sciences of Moldova) - specific sampling procedures related to physiographic and climatic conditions in partner countries across the DRB;

UA-UGC (State Enterprise "Ukrainian Geological Company") - problems regarding HSs monitoring across partner countries;

BG-GI-BAS (Geological Institute, Bulgarian Academy of Sciences) - will review HSs measured in sediment across partner countries.

Sampling WG review

AT-GBA (Geological Survey of Austria), Sebastian Pfleiderer

- *suspended sediment sampling procedures. The review includes methodology for suspended sediment sampling. That means position in the stream (for example in the middle of the river, closer to river banks,...), sample volume/mass, tools and procedure including time needed to collect specific volume/mass.*

- in the national **questionnaires** only the **Geological Institute of Romania** describes the method they use for suspended sediment sampling;
- articles, Edwards & Glysson (1999) and Lalk et al. (2017) provide the most detailed descriptions.

Sampling WG review

SI-GEOZS (Geological Survey of Slovenia), Jasminka Alijagić

- floodplain sediment sampling procedures. The review includes methodology for floodplain sediment sampling. That means sampling location (for example how far from the stream,...), sample volume/mass, tools and procedure.

- Austria, Moldova, Croatia – they sample the floodplain sediment;
- Romania, Slovakia, Slovenia, Ukraine – they do not sample floodplain sediment;
- Bulgaria, Bosnia, Republic of Srpska, Hungary, Montenegro – no data.

- Sampling location: no data.
- Sample volume/mass: different mass, but mostly no data.
- Tools: various (stainless steel shovels, PVC or ceramic spoons, scoops, ...)
- Procedures: different.

Sampling WG review

BA-FZG (Geological Survey of Federation of Bosnia and Herzegovina), Ismir Hajdarević

transport and storage of sediment samples. Transport and storage equipment (bags, boxes,...). For how long are samples archived, special conditions for storage,...

Transport:

Austria, Bosnia and Herzegovina (Federation of B&H) - no specific methodology;

Bosnia and Herzegovina (Republic of Srpska), Bulgaria, Hungary, Montenegro – no data;

Croatia, Moldova, Slovakia - use refrigerators; Germany - in brown glass bottles;

Romania - suspended sediment on filters; Ukraine - dried and sieved;

Slovenia - ISO 5667 – 15: 2010 Water quality - Sampling .

Archive:

Austria, Bosnia and Herzegovina (Federation of B&H) - samples keep until project completion;

Bosnia and Herzegovina (Republic of Srpska), Bulgaria, Hungary, Montenegro, Slovakia - no data;

Croatia, Slovenia - samples are not archived; **Germany, Moldova, Romania, Ukraine – archived.**

Sampling WG review

UA-UGC (State Enterprise "Ukrainian Geological Company"), Volodymyr Klos
- *problems regarding HSs monitoring across partner countries.*

Summary:

- in all countries the **level** of surface water at the hydrological stations is monitored;
- use of different **coordinate** systems;
- **frequency** of monitoring is not always indicated (with the exception of Bulgaria);
- maximum experience in sediment **monitoring in Slovakia**;
- in the questionnaires - no information on the analysis of suspended substances in the water flow.

Sampling WG review

Conclusions:

- the use of an **unified** coordinate system;

- before the Vienna meeting or **before adopting** the final field research methodology - a short **report of Slovakia** about experiences in monitoring;
- similar reports from Hungary, Austria, Romania, Bulgaria – project **DanubeSediment**;
- Croatia - the results of the project Monitoring of Drava alluvial sediments ;

- the **source** of geochemical anomalies in bottom sediments – **scientific** research;
- no information about the analysis of suspended solids in the water flow – poor knowledge about it - it is possible that this **type of monitoring** should not be included in the SIMONA project – the need of more detailed **scientific** research.

Interreg
Danube Transnational Programme
SIMONA

Sampling WG review

BG-GI-BAS (Geological Institute, Bulgarian Academy of Sciences), Millena Vetseva

review HSs measured in sediment across partner countries. (Within this review, we should also check if there are some HSs which are not prescribed by EU WFD, specific for some partner countries because of some particular reasons (type of industry, agriculture legislative different than in EU,...).

Hazardous substances measured in sediments – priority substances prescribed by the EU WFD and specific substances – review

- the problem with the missing information is not incomplete questionnaires - **missing question** in the Qs about hazardous substances **measured in sediments**;
- preliminary **excel table** with a summary of data (HSs recommended in the Directive marked in green);

Sampling WG review

- **question** for partners: the HSs in bottom, floodplain and suspended sediment – is there any difference in the analyses in the different type of sediments;
- **contradiction** between the statement that most countries are sampling sediments - bottom, floodplain, suspended, but NO HSs are listed as analyzed;
- list of hazardous substances measured **in SOILS**;
- list of substances analyzed **in sediments – no data**,

except for

- **Slovakia:** - list of **hazardous substances concentration levels in sediments** and **overview of legislation** limiting the management of sediments on the basis of the limit values for selected elements in sediments (sediment leachates).

Sampling WG review

HU-BME (Budapest University of Technology and Economics), Barbara Keri

- sediment sampling methods related to DTP DanubeSediment project on sediment quantity;

Presentation: Sampling in large rivers

MD-IGS-ASM (Institute of Ecology and geography of the Academy of Sciences of Moldova)

- review if there are some specific sampling procedures related to physiographic and climatic conditions in partner countries across the DRB; This is more appropriate for evaluation purposes, but still, maybe there are some specific conditions for sampling.

RS-JCI (Institute for Development of Water Resources "Jaroslav Černi")

- bottom sediment sampling procedures; The review includes methodology for bottom sediment sampling. That means position in the stream (for example riverbed, inner/outer side of meander,...), sample volume/mass, tools and procedure.

Sampling WG review/Development

HR-HGI-CGS (Croatian Geological Survey)

sampling strategy, (including spatial and temporal sediment sampling design). The review includes methodologies for selection of sediment sampling locations and setting sediment sampling frequency. It also includes information on number of replicate samples and fraction to be analyzed.

The legal basis for the monitoring of PSs in sediment in EU

+

the state of the art in particular country and knowledge of a topic of

the partners (WP4 Activity 4.1. Review)

+

knowledge and experience acquired in the projects

FOREGS, GEMAS, DanubeSediment

Sampling WG CIS guidance/WFD framework

Directive **2008/105/EC** (Environmental Quality Standards Directive) and Water Framework Directive **2000/60/EC** (WFD)

Common Implementation Strategy for the Water Framework Directive (2000/60/EC)

Guidance Document No. 25
Guidance on Chemical Monitoring of Sediment and Biota under the Water Framework Directive

Guidance Document No. 19
Guidance on Surface Water Chemical Monitoring under the Water Framework Directive

Guidance Document No. 27
Technical Guidance for Deriving Environmental Quality Standards

Guidance document No. 7
Monitoring under the Water Framework Directive

Guidance document No. 9
Implementing the Geographical Information System Elements (GIS) of the Water Framework Directive (unified coordinate system: the ETRS89 coordinate reference system prescribed)

Monitoring of chemical substances in sediment

(Guidance Document No. 25)

1. Sampling strategy for chemical monitoring in sediment
2. Technical aspects of sediment sampling
3. Analytical methods

1. Sampling strategy for chemical monitoring in sediment

1.1. Selection of sediment sampling stations

- sediments are temporally variable; heterogeneous;
- anthropogenic source of pollution;
- tributaries often different sediment;
- sites with the sediment fraction <63 µm;
- alternatively suspended solid matter (SPM) - river channelization;
- sites should be accessible for years;
- ....

Sampling WG Review/Development

1.2. Number of replicate samples per station

- multiple samples in pilot phase (3-5);
- later composite samples;
- field duplicates for quality control;
- ...

1.3. Sediment sampling frequency

- once a year for – directive 2008/105/EC:
- once every three years for temporal trend analyzes;
- rule **higher** the sediment **changes** – **higher the frequency** it could be several times per year;
- suspended solids for trend analyses 4 times per year or better monthly;
- ...

Sampling WG Review/Development

1.4. Sediment sampling depth

- thick of the top layer (usually 5 - 10 cm);
- recommended 1 – 5 cm - depending of the deposition rate;
- different intervals for sediment core profiles;
- ...

1.5. Sediment fraction to be analyzed

- recommended <63 µm (clay-silt) fraction:
    - widespread in monitoring,
    - reduce influence of grain size distribution;
    - it is SPM or freshly deposited sediment.

2. Technical aspects of sediment sampling

Of the **ISO 5667 series of standards** important for sediment sampling:

- Design of sampling programs [ISO, 2006];
- Preservation and handling of samples [ISO, 2003];
- Sampling of rivers and streams [ISO, 2005];
- Sampling from lakes [ISO, 1987];
- Sampling of bottom sediments [ISO, 1995];
- Guidance on preservation and handling of sludge and sediment samples [ISO, 1999];
- Sampling of marine sediments [ISO, 2004].

Sample volume, Sediment sampler, Grab samplers, Corers, Collecting of SPM and freshly deposited sediments, Transport and sieving, Preservation and Storage.

Sampling WG future tasks

1. Complete WORK PLAN for WP4 - Activity 4.1. (February 2019 – March 2019)
    - review missing topics;
    - check/update all reviews with the updated questionnaires.

2. WP4 Activity 2 – ***Development*** - April 2019 – August 2019

Sampling WG - future tasks

WP4 Activity 2

Development of transnationally harmonized sediment sampling protocols for HSs of bottom, suspended and floodplain sediment

Includes:

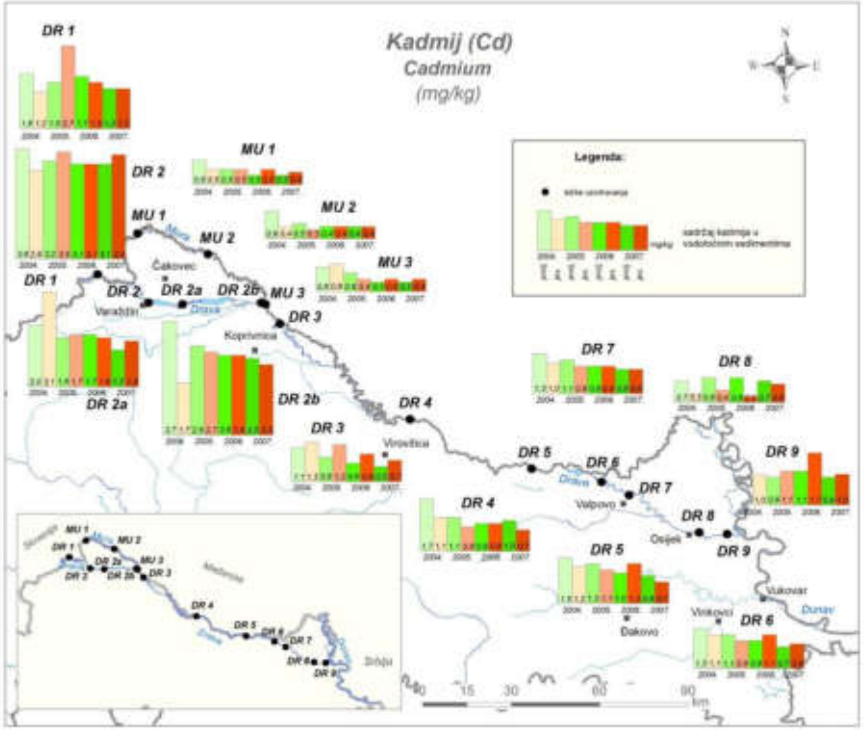
- proposal for sampling design and monitoring;
- method/s for sampling technique and procedure;
- protocols.

Sampling WG

Danube Transnational Programme

SIMONA

Monitoring of the stream sediment at Rivers: Drava and Mura (Croatia)



<u>Duration:</u> 4 years, 2004-2007

<u>Frequency:</u> 2 times per year, every six months, 1x in spring and 1x in autumn

<u>Locations:</u> Rivers Mura (3 location) and Drava (11 locations)

<u>Samples:</u> composite

<u>Laboratory:</u> fraction <0.04 mm, *aqua regia*, ICP MS

<u>Accuracy:</u> standards: LKSD-2 and DS-7

<u>Precision:</u> duplicate samples (every 10^{th})

<u>Results:</u> Concentration of the elements Pb, Zn and Cd were several times less in the River Mura then in the River Drava. The concentration in the Drava River decreases downstream.

<u>Source of the elevated values of Pb, Zn and Cd:</u> geogenic and anthropogenic (Pb-Zn (Cu, As, Cd)) ore deposits and occurrences, mining, erosion of old slugs (Bleiberg, Austria; Mežica, Slovenia)

Interreg
Danube Transnational Programme
SIMONA

Sampling WG members

https://docs.google.com/spreadsheets/d/1Us2HXR5TaEVRQFogWI0OnKSF6So5FXOIHAXadHgBXFA/edit?usp=sharing

WG 1 SAMPLING				
Name	Organisation	Org. Code	Email	Role
Ajka Sorsa	**Croatian Geological Survey**	**HR-HGI-CGS**	**asorsa@hgi-cgs.hr; ajkasorsa@gmail.com**	**WG LEADER**
Gyozo Jordan	**Szent Istvan University**	**HU-SZIE**	**gyozojodan@gmail.com**	**SCI. COORDINATOR**
Ajka Sorsa	Croatian Geological Survey	HR-HGI-CGS	asorsa@hgi-cgs.hr	WP 4 LEADER
	Austrian Institute of Technology GmbH	AT-AIT		Member
	Geological Survey of Federation of Bosnia and Herzegovina	BA-FZG		Member
	Geological Institute, Bulgarian Academy of Sciences	BG-GI-BAS		Member
	Institute of Geology and Seismology	MD-IGS-ASM		Member
	Geological Survey of Montenegro	ME-GSM		Member
	Geological Institute of Romania	RO-IGR		Member
	Geological Survey of Slovenia	SI-GEOZS		Member
Jozef Kordik	State Geological Institute of Dionyz Stur	SK-SGIDS	jozef.kordik@geology.sk	Member
Volodymyr Klos	State Enterprise "Ukrainian Geological Company"	UA-UGC	v.klos@ukrgeol.com	Member
	Budapest University of Technology and Economics	HU-BME		Member
	Institute for Development of Water Resources “Jaroslav Černi”	RS-JCI		Member
Danijel Ivanišević	Croatian Geological Survey	HR-HGI-CGS	divanisevic@hgi-cgs.hr	Member
Ivan Mišur	Croatian Geological Survey	HR-HGI-CGS	imisur@hgi-cgs.hr	Member
Aleksandra Kovačević	Public institution Waters of Srpska	BA-JUVS	akovacevic@voders.org	ASP
Kristina Šarić	Faculty of Mining and Geology - University of Belgrde	RS-UB	kristina.saric@rgf.bg.ac.rs	Member
Suzana Erić	Faculty of Mining and Geology - University of Belgrde	RS-UB	suzana.eric@rgf.bg.ac.rs	Member

Update.

Interreg
Danube Transnational Programme
SIMONA

Thank you for your contribution to the Review!

Thank You for Your Attention!

Inventory Workshop of the SIMONA Project

10th – 11th April, 2019, Vienna

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

SIMONA – SAMPLING

IUGS – FOREGS - GEMAS

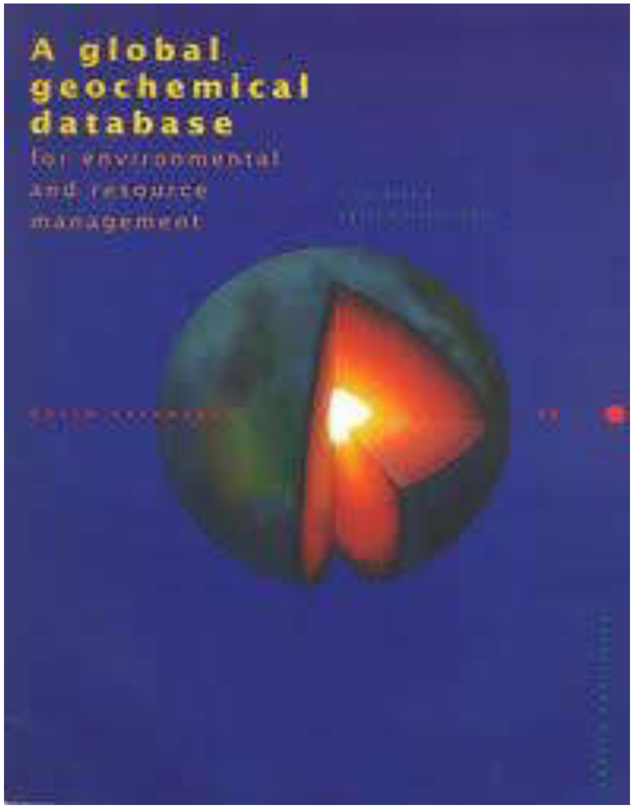
Sediment sampling protocols

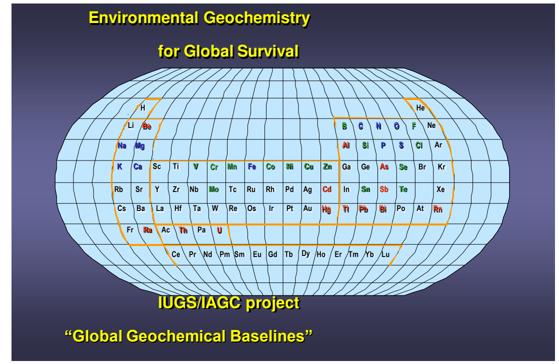
Gyozo Jordan, *Szent Istvan University*

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

Interreg
Danube Transnational Programme
SIMONA

IUGS - Global Geochemical Mapping





IUGS

International Association of GeoChemistry
IAGC
Est.1967

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

Contents

IUGS - Global Geochemical Mapping

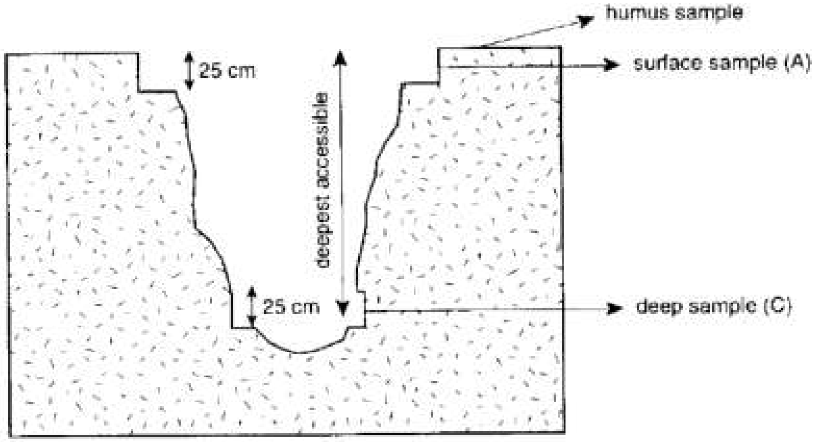


Figure 4-4 Schematic outline of sampling pattern and sampling pit for Geochemical Reference Network. The site distribution in A is greatly preferable to B. The sample pit applies to all residual soil locations. Collection of the lower sample is optional in overbank and floodplain situations.

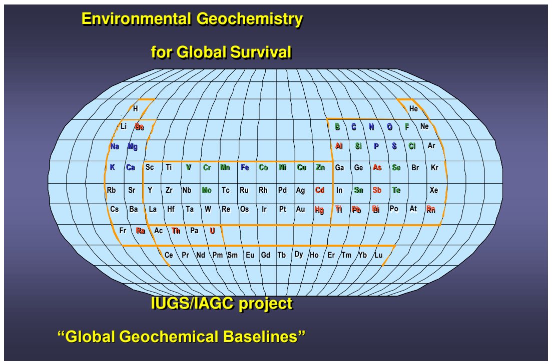
4.5.2.1 Stream sediment

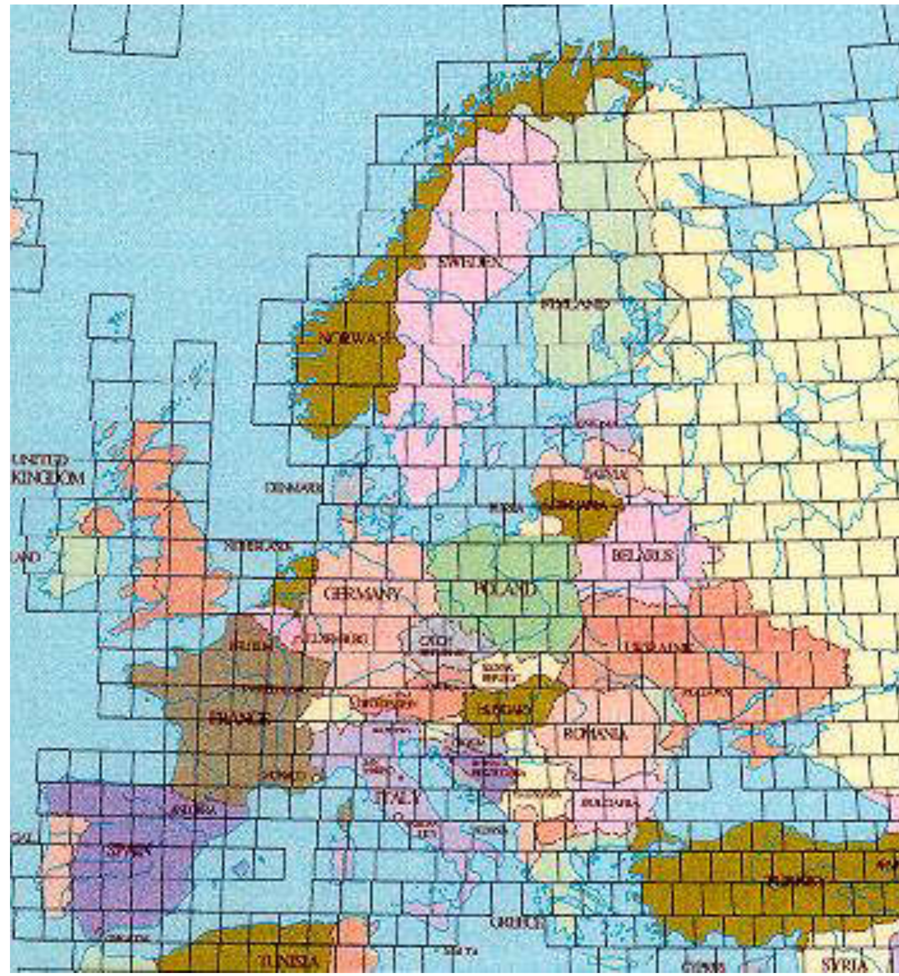
Samples should be collected at the outflow of basins, preferably not exceeding 100 km² in area. Basin size is the prime consideration in site selection for drainage samples and all types of sample should be collected in the same vicinity. The basins to be sampled will be from within the 20 (or 40) km sub-cells selected as indicated in Section 4.4 above. It is acceptable to sample basins which extend into adjoining subcells.

Samples should be collected from the inorganic fine-grained silt and clay fraction of the stream bed load. *In situ* precipitates should be avoided. Active sediment is the preferred material. A minimum of 10 grab samples should be collected in each stream from different parts of the stream bed over a minimum distance of 500 m. Collectively these constitute one site.

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

FOREGS – European Geochemical Mapping

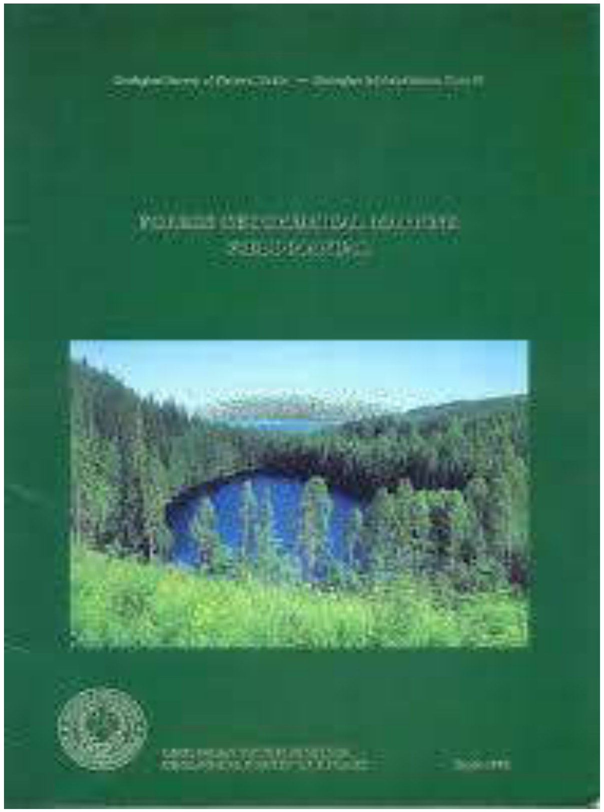


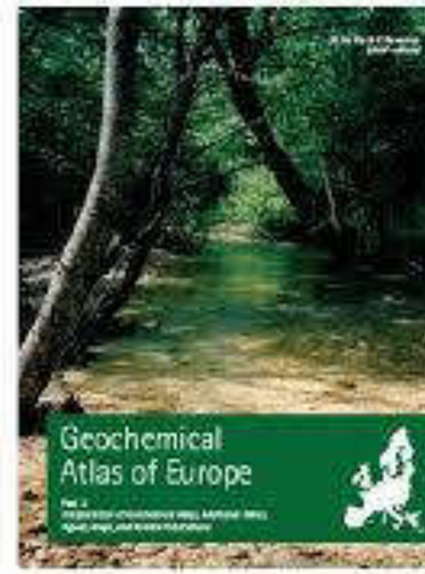


Project co-funded by the European Union
http://www.interreg-danube.eu/approved-projects/simona

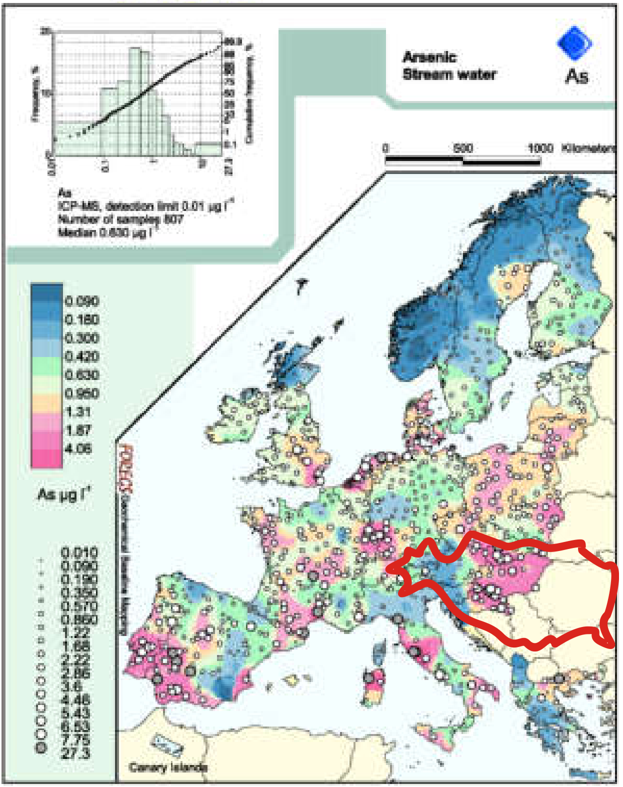
Interreg
Danube Transnational Programme
SIMONA

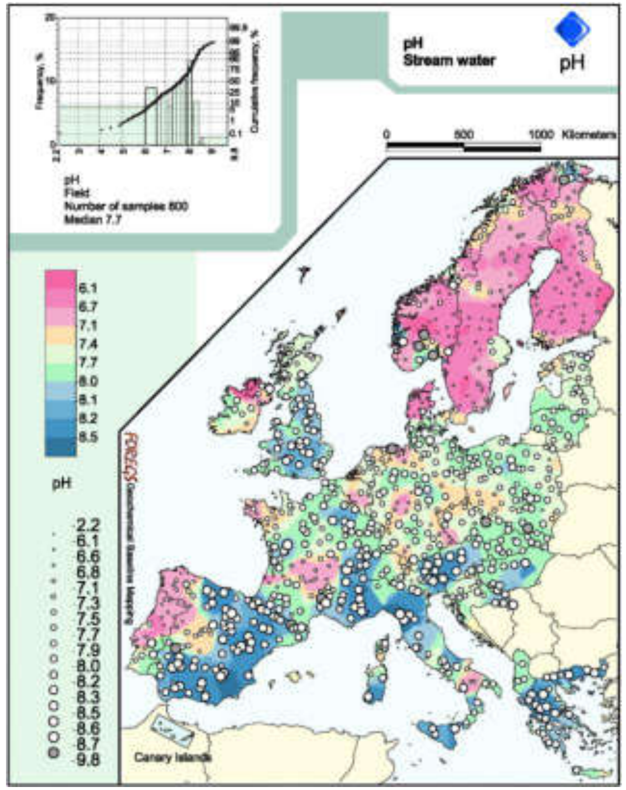
FOREGS – European Geochemical Mapping

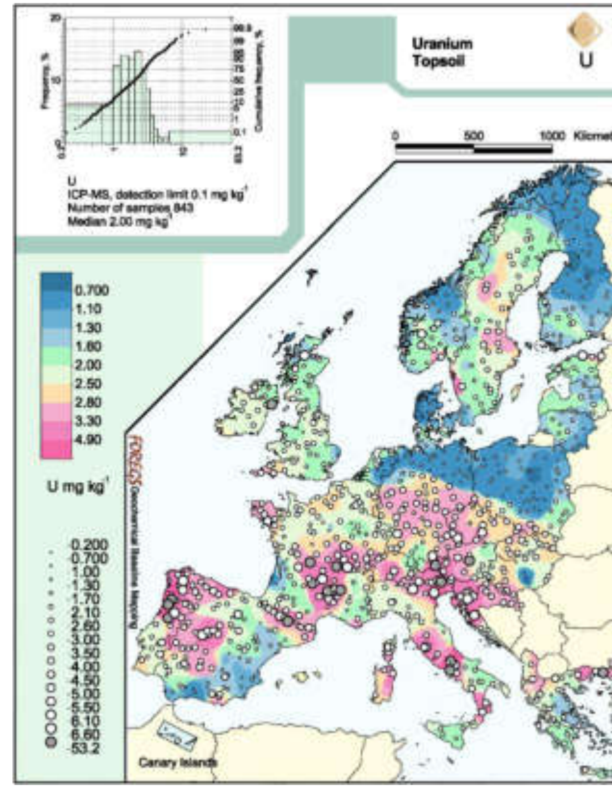




FOREGS – European Geochemical Mapping







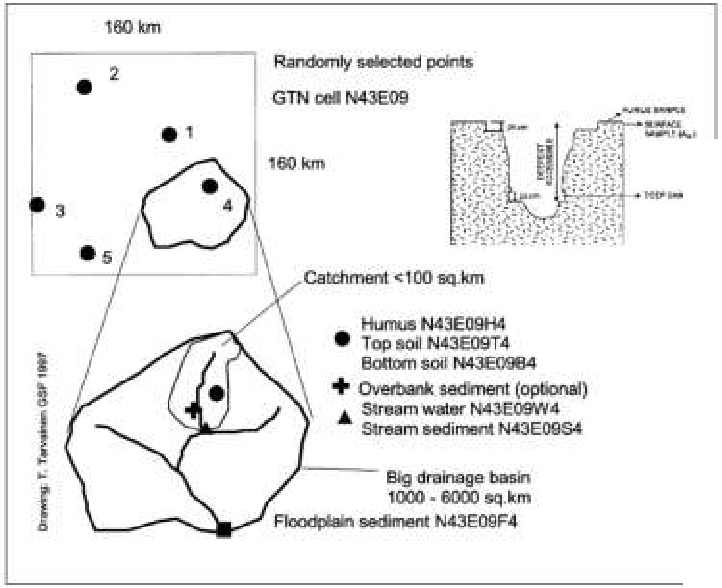
- **Multi-media**
  stream water, stream and floodplain sediment, soil (A and C horizons)
- **Multi-element**
- **Composite (elements, parameters: pH, OM, etc.)**
- **Catchment-based**
- **Continental**

Home | Geochemical maps | Chemicals | Project info

Geochemical maps - European Union - Cd

topsoil

description | contact | back



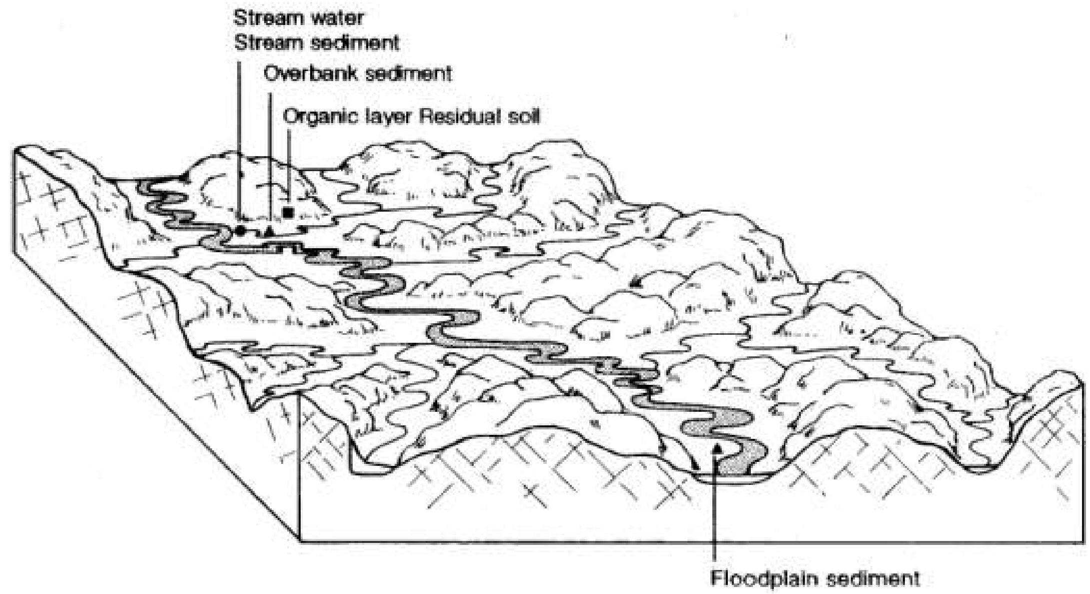


Fig. 4. Block diagram showing possible sampling sites of GTN sampling media (modified after Strahler 1969).

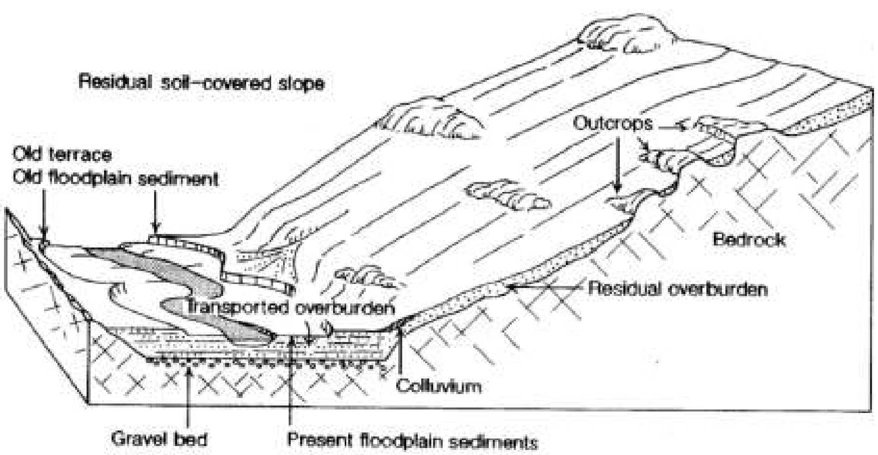


Fig. 5. Block diagram showing residual overburden (soil), colluvium, old and present day floodplain sediments (modified after Strahler 1969).

3. Place the bottles in a cool unit, e.g. refrigerator.
4. Send water samples to the laboratory soon after sampling.

3.2 Stream sediment

Active stream sediment represents the fine- to medium-grained bed load material (silty-clayey-sandy), which is transported by running water. The active stream sediment is collected from the small, second order, drainage basin (< 100 km^2) at a suitable site above its confluence point with the third order, channel of the large drainage basi

Studies into the distribution of trace eleme relation to the size fraction of stream sediment erally show that several elements including M Zn, Mn and Fe are concentrated in the finest tions of the sediment. The majority of stream ment surveys have, therefore, been based on th lection of <0.200 mm material. The IGCP 25 FOREGS standard sieve mesh is <0.150 mm a is fine enough to only include the very fine silt, clay and colloidal fractions, but is coarse e to yield sufficient fine material in the major

3.2.1 Stream sediment samples to be collected

Each stream sediment sample comprises material taken from 5-10 points over a stream stretch of 250 - 500 m. Prior to stream water and stream sediment collection, it is important to identify the 250 - 500 m stream stretch where obvious signs of contamination can be avoided and suitable sediment can be collected from 5-10 different locations. Sites should be located at least 100 m upstream of roads and settlements. Stream sediment sampling should start from the wa-

situations.

Studies in the UK have shown the recovery of stream sediments by dry sieving methods is not quantitative owing to the agglomeration of fine material to form larger particles which are then screened out in varying amounts. A system of wet sieving stream sediments wherever possible is therefore recommended for IGCP 259/360 and FOREGS.

It is important to avoid metal contamination at every stage of sampling as follows;

> No hand jewellery or medical dressings should be worn during sampling. If medical dressings are worn, heavy duty rubber gloves must be worn at all times to avoid contamination of the samples.
> Metal free polyethylene or unpainted wooden spades/scoops should be used.
> Metal free nylon sieve-mesh housed in inert wooden or metal free plastic frames should be used.
> Metal free funnels and sample collection containers should be used.

If it is not possible to use non-metal equipment (e.g. spades and sieve frames), unpainted steel equipment should be used. Aluminium and brass equipment should be avoided.

Sampling sites should be selected sufficiently upstream of confluences with higher order streams to avoid sampling sediment that may result from a mixing of material from the two channels during flood

3.2.2 Equipment

3.2.2.1 Equipment to be provided by regional laboratories:

-Kraft paper bags
-Polyethylene bags

3.2.2.2 Equipment to be purchased by each participant:

-Heavy duty elbow length rubber gloves
-Metal free polyethylene funnel
-Sieve set with 2 preferably wooden or plastic frames containing nylon 2.0 mm mesh and nylon 0.150 mm mesh screens
-Metal free gold pan or plastic bucket
-Metal free plastic crates
-Metal free plastic buckets or containers with lids
-Trenching tool - metal free, polyethylene (PE) or polypropylene (PP)
-Permanent drawing ink marker (preferably black or blue)
-Permanent ink pen
-Maps (topographical maps, preferred scale 1:50 000)
-Chisel-end geological hammer for dry areas (e.g. Mediterranean countries)
-Bristle brush (dry sediment samples)

Field observation sheets are included in this

3.2.3 Sampling procedure

Mark the sample identifier on the Kraft paper bag using permanent ink marker. Mark the exact site location of the first and last subsamples on the field map by means of a small lines perpendicular to the stream flow. Complete the details of the field observation sheet.

Wet sieving is recommended whenever it is possible. Instructions for sampling with wet sieving method are presented in section 3.2.3.1. If it is not possible to wet sieve the stream sediment sample in the field, the collected stream sediment material should be dry sieved. Instructions for sampling and dry sieving are given in section 3.2.3.2.

3.2.3.1 Sampling and wet sieving

Once the site for sampling has been selected, mark the exact location of the first and last sampling points on the field map by means of a small line perpendicular to the stream flow using the ink pen. Mark the sample identifier number on map next to the sampling location. Complete the details on the field observation sheet. Write the sample identifier on the collection bucket and lid using the permanent drawing ink marker.

Rubber gloves are recommended for protection throughout sampling.

-Enough coarse grained material should be collected to yield a minimum of 0.5 kg <0.150 mm material (dry weight).

The amount of coarse material required will vary substantially depending on the underlying geology and terrain. Geochemists should use their knowledge and judgement to assess how much coarse material will be required.

-Mix the buckets of the coarse sediment thoroughly with the plastic stirring rod and carry them to the sieving location

-Load sediment into the top sieve with the spade. If more than one bucket of coarse sediment has been collected, equal amounts of sediment should be loaded into the sieve from each bucket in turn.

-Rub the material through the top sieve wearing rubber gloves for protection.

-Take care to remove large stones from the sediment by hand.

-Once the bottom sieve contains a reasonable quantity of <2 mm sediment, remove the top sieve and discard the >2 mm material.

-The <2 mm sediment in the bottom sieve is washed and rubbed through the sieve with the aid of water and shaken down.

-It is very important at this stage that coarse material which would bias the sample does not enter the collection bucket. This may be avoided by carefully washing the outside of the bottom sieve prior to shaking.

-In order to enhance the trace element signature, it is recorded on the field sheet and on a sample check-list sheet.

-Once the sample has been homogenized, carefully transfer the sample into the Kraft bags using a clean plastic funnel.

-The Kraft bags should be hung out to air dry at the field base for as long as possible.

-When moving the samples, place each Kraft bag in a 15 x 40 cm polythene bag and secure the top of the bag with a knot to prevent loss or cross contamination of samples during transport.

-The samples should be secured upright in a plastic crate or box and transported carefully to the next location or to the Survey base for further drying.

-At the Survey base or laboratory, the samples should be completely dried at < 40°C. Freeze drying is a recommended as this helps to disaggregate the samples. Dried samples should be sent to LAB I.

All sampling equipment must be thoroughly cleaned between each site to avoid cross contamination.

3.2.3.2 Sampling and dry sieving

The procedure for the selection of sample sites, recording their location on the field map, completion of field observation sheets, wearing of rubber

be a field composite sample from 3 - 5 subsamples in the field. Minimum distance between any two subsamples should be 5 m. Avoid sampling adjacent to roads (minimum distance 10 m) or ditches (minimum distance 5 m), but you are free to use your discretion depending on the traffic density and prevailing local conditions.

Living surface vegetation, fresh litter, big roots and rock fragments (stones) are removed.

In case the whole soil profile does not reach a depth of 75 cm, the lower sample should be taken from a depth, that can be undoubtely identified as the BC- or C-horizon (do not forget to note this down under remarks on the field observation sheet!). If this is not possible another sample site should be selected.

The subsoil sample is taken first, and then the topsoil sample. This procedure avoids cleaning the surface of the subsoil from fallen top soil, if the latter is taken first.

After collection of each sample clean thoroughly the sampling equipment.

OPTIONAL:

From one sampling site of a duplicate cell 2 kg of bottom floodplain sediment + 2 kg of bottom floodplain sediment (duplicate sample) and from all other sampling sites 2 kg of bottom floodplain sediment.

mus samples and residual soil samples are collected from the same site, the close-up photo can show both the character of organic layer and mineral soil horizons (see below). In this case, separate photographs for the soil sample site will not be needed.

At each soil sample site two photographs should be taken; the first to show the general view about the sampling site (Fig. 9), and the second a close-up of one of the soil sample pits (Fig. 10). Before taking

3.4 Floodplain sediments

A floodplain sediment, representing the alluvium of the whole drainage basin will be collected from the alluvial plain at the lowermost point (near to the mouth) of the large catchment basin (1000 - 6000 km^2).

Both floodplain and overbank sediments are fine-grained (silty-clay, clayey-silt) alluvial soils of large and small floodplains respectively, according to the size distinction made by Darnley *et al.* (1995). Floodplain and overbank sediments are deposited during flood events in low energy environments (Ottesen *et al.*, 1989); they should, therefore, be devoid of pebbles, which indicate medium energy environments. The surficial floodplain and overbank sediments are normally affected by recent anthropogenic activities, and may be contaminated. Deeper samples, which are optional sample media, normally show the natural background variation.

3.4.1 Floodplain sediment samples to be taken

From the first sampling site of a duplicate cell (one in each country) collect:

- 2 kg of top floodplain sediment + 2 kg of top floodplain sediment (duplicate sample)

From all other sampling sites collect:

- 2 kg of top floodplain sediment

Enough material must be taken to yield minimum 0.5 kg of <2 mm grain size sediment. Larger sample quantities can be taken and stored separately in each country.

Fig. 11. Floodplain sampling in southwestern Finland (Photo: Reijo Salminen, GSF).

Fig. 12. Floodplain sediment sequence with soil development in Greece. Meter: coloured sections 20 cm. Fine-grained clay and silt down to a depth of 75 cm (low energy floodplain sediment - good for sampling; soil has developed down to a depth of 25-29 cm). Coarse-grained sandy and bebbly unit between 75-100 cm (high energy environment). Sandy-clay unit between 100-134 cm (low-energy environment). Gravel bed below a depth of 134 cm. Photo: A. Demetriades, IGME.

3.5 Overbank sediments

An overbank sediment, representing the alluvium of the small drainage basin will be collected from its alluvial plain near to the confluence point of the small, second order, stream (< 100 km^2) with the main, third order, river.

3.5.1 Overbank sediments to be taken

All overbank sediment samples are optional. FOREGS laboratories will not provide analyses of

Sample preparation

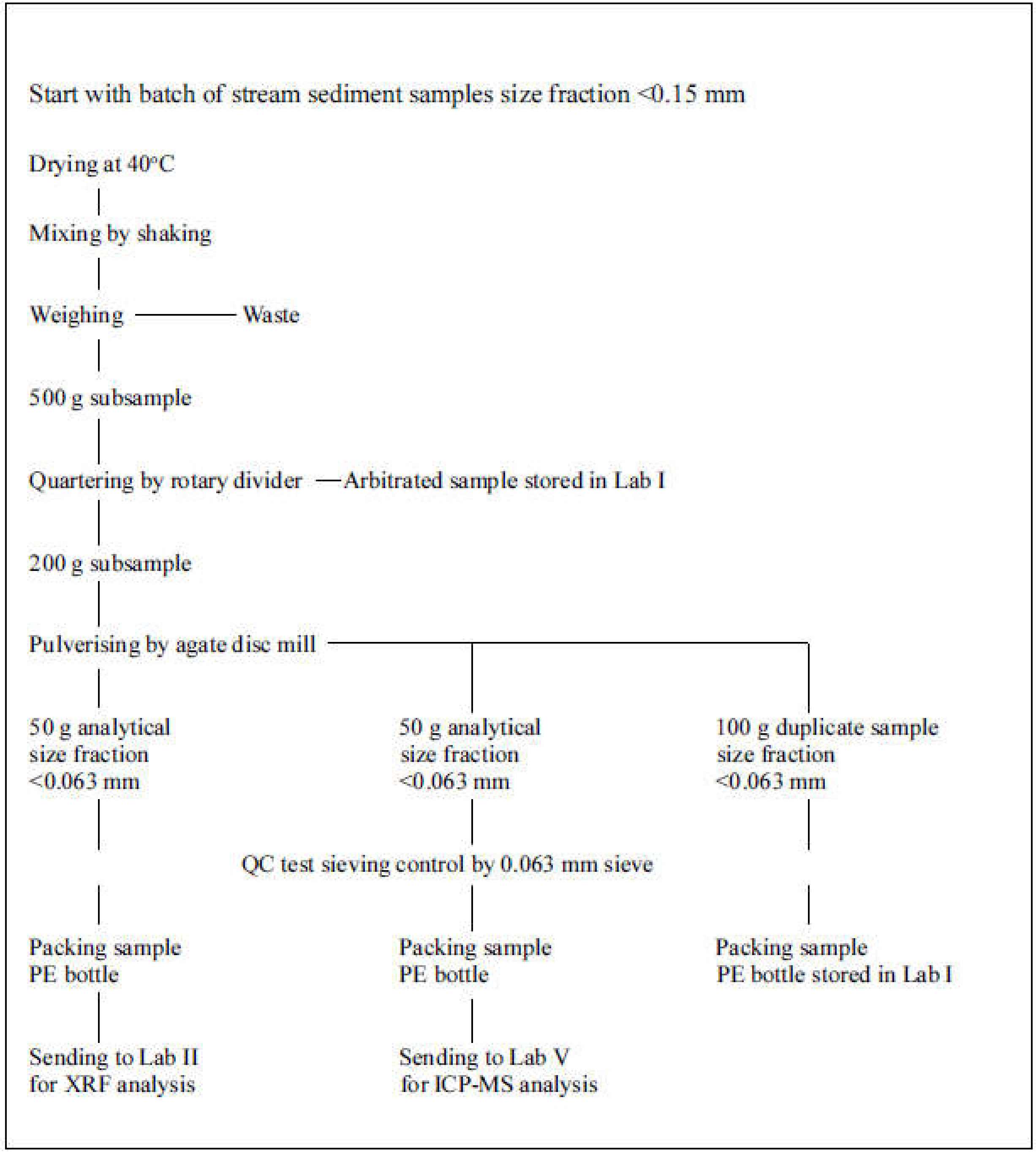


Fig. 13. Screening standard operating procedure for stream sediment samples.

Field sheet

FOREGS GEOCHEMICAL BASELINE PROGRAMME **FLOODPLAIN SEDIMENT**

TOP ID ____________ Date ____________ Sampler ____________

BOTTOM ID____________ Country ____________

(Bottom floodplain sample is optional) Organisation ____________

GTN cell coordinator if different from above ____________

SAMPLE SITE LOCATION REGION ____________ MAP SHEET ____________

COORDINATES **(Decimal degrees mandatory)**

National grid Easting ____________ Northing ____________

Decimal degrees Longitude ____________ Latitude ____________ Datum ____________

Altitude (m) ____________

DESCRIPTION OF CATCHMENT BASIN

Approximate size of catchment basin ____________ km^2

Landscape / topography ____________

Land use

- □ Agriculture
- □ Pasture, grassland, fallow field
- □ Forest:
- □ Wetland
- □ Non-cultivated, moorland etc.
- □ Other, specify ____________

Predominant bedrock lithology within catchment basin ____________

SITE DESCRIPTION

River width ____________ m, depth ____________ m

Grain size range at sample site □ sand - silt □ silt - clay

Abundance of clasts > 2 mm in %: ____________

Depth of observed groundwater table (cm) ____________

Sampling interval from surface □ 0 - 25 cm □ other, specify: ____________ cm

Possible sources of contamination, specify ____________

PHOTOS Film and photo ID

Landscape ____________

Site ____________

GAMMA-RADIATION Total ____________ Th ____________ U ____________ K ____________

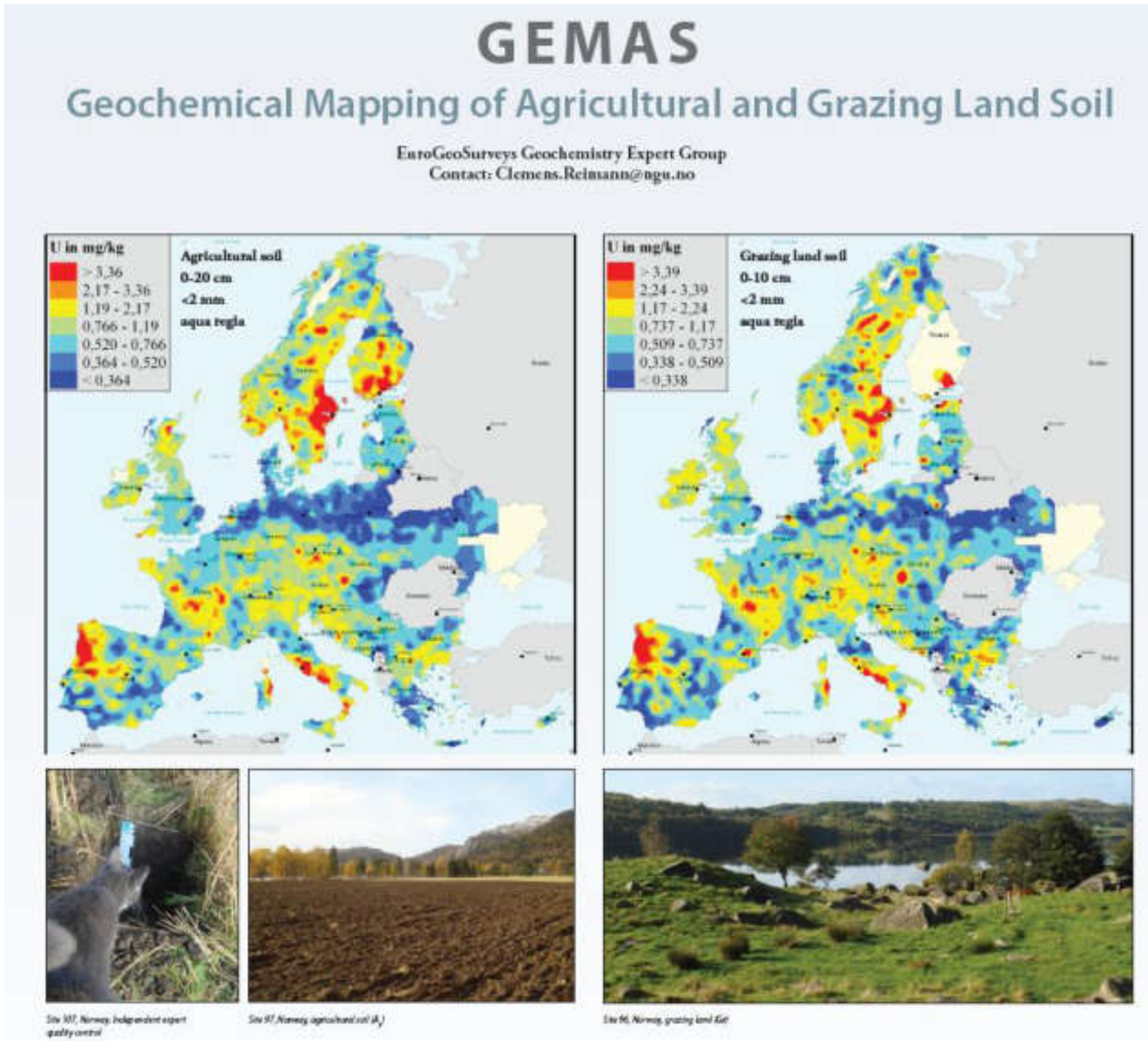
Instrument ____________

REMARKS

Interreg
Danube Transnational Programme
SIMONA

GEMAS – European Soil Chemistry Atlas

Quality Control



Interreg
Danube Transnational Programme
SIMONA

GEMAS – European Soil Chemistry Atlas

TRAINING !

Harmonisation of Analytical methods for Sediment-quality Information, Monitoring and Assessment System

Péter Fodor
Szent István University
Fodor.Peter@etk.szie.hu

Wienna, 2019

Self introduction:
Diploma at Technical University of Leningrad.
PhD at Technical University of Budapest (Dept. of General and Analytical Chemistry)
Post doc at Univ. of Massachusetts (Amherst)
From 1988-2008. Head of Dept. Applied Chemistry of Food Science Faculty
From 1992 Doctor of Hung.Sci. Ac.
From 1995 Head of the Accreditation board of Hungary and member of Codex Alimentarius.

SZENT ISTVÁN EGYETEM

SZENT ISTVÁN
EGYETEM

Our Task: Develop Protocols for:

1.Analytical methods for measuring pesticides

2.Analytical methods for measuring organic industrial pollutions

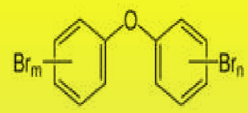
3.Analytical methods for measuring inorganic compounds as heavy metals

Which component to measure?

COMMON IMPLEMENTATION STRATEGY
FOR THE WATER FRAMEWORK DIRECTIVE (2000/60/EC)
Guidance Document No. 25

As a rule of thumb, compounds with a log Kow>5 (octanol-water) should *preferably* be measured in **sediments,** or in suspended particulate matter (SPM), while compounds with a log Kow<3 should preferably be measured in water.

Anthracene (PAH)



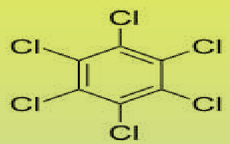
Brominated diphenyl ethers

C10-13-chloroalkanes $C_{10}H_{18}Cl_4$ and $C_{13}H_{21}Cl_7$

Chlorpyrifos (-ethyl, -methyl)

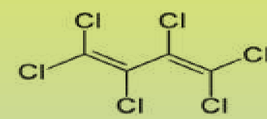
Di(2-ethylhexyl)phthalate (DEHP) (PVC)

Fluoranthene (PAH)



Hexachlorobenzene

Hexachlorobutadiene



Hexachlorocyclohexane -Lindane

Nonylphenols (detergent)

Pentachlorobenzene (PAH-pesticide)

Polyaromatic Hydrocarbons: **Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)-pyrene**

Trifluralin

DDT (including DDE, DDD)

Aldrin

Endrin

Dieldrin

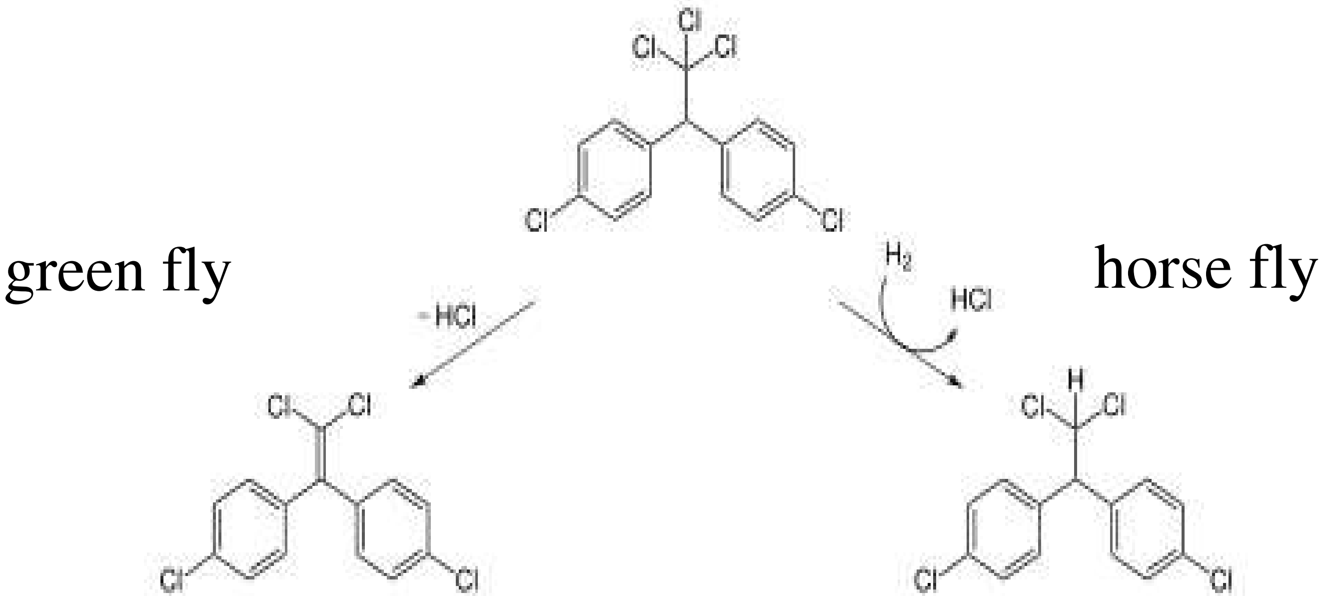
Priority Substances relevant to the European Comission's 2012 proposal under the Water Framework Directive:

Pesticides (herbicides, insecticides): Aclonifen, Bifenox, Cypermethrin, Dicofol, Heptachlor, Heplataclorepoxide, Quinoxyfen, Cybutrine, Dichlorvos, Tetrabutryn
Industrial chemicals: Perflourooctane sulfonic acid(PFOS), Hexabromocyclo-dodecane (HBCDD)
Combustion by products: Dioxins and dioxin-like PCB-s
Pharmaceutical substances (steroids-hormons): 17-alpha-ethinylestradiol, 17-beta-estradiol, Diclofenac

16 Pesticides (herbicides, insecticides): Aclonifen, *Aldrin,*Bifenox, Cypermethrin, *Chlorpyrifos (-ethyl, -methyl), DDT (including DDE, DDD),* Dicofol, *Dieldrin, Endrin,* Heptachlor, Heplataclorepoxide, Quinoxyfen, Cybutrine, Dichlorvos, Tetrabutryn, *Trifluralin*

*+ **Hexachlorobenzene , Hexachlorocyclohexane***

EPA 8270



Degradation of DDT to form DDE (by elimination of HCl, left) and DDD (by reductive dechlorination, right)

Polyaromatic Hydrocarbons: Anthracene, **Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)-pyrene,** *Fluoranthene,*

EN 16181:2018

Semivolatile organic compounds:

Brominated diphenyl ethers EPA 1614A

C10-13-chloroalkanes EN ISO 12010

Hexachlorobutadiene EPA 8260C

Industrial chemicals:

Perflourooctane sulfonic acid(PFOS) **CEN/TS 15968**

Nonylphenols ***EN ISO 18857-2***

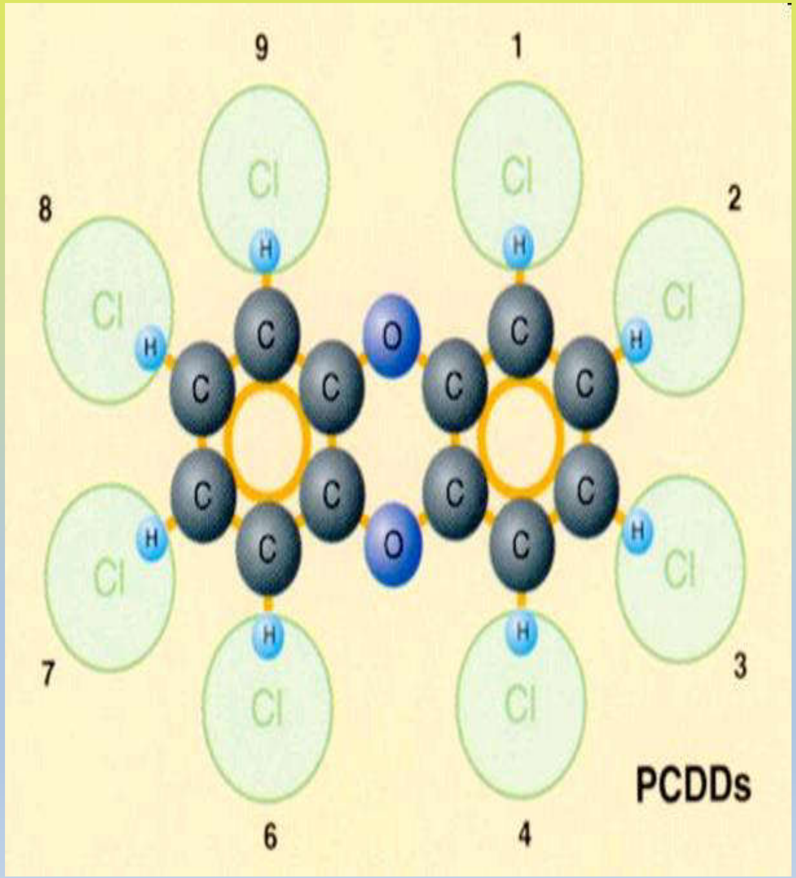
Hexabromocyclo-dodecane (HBCDD)
No standardized method
Chemosphere 82 (2011) p. 698-707 :
„Determination of HBCD isomers by isotopic dilution LC-MS/MS"

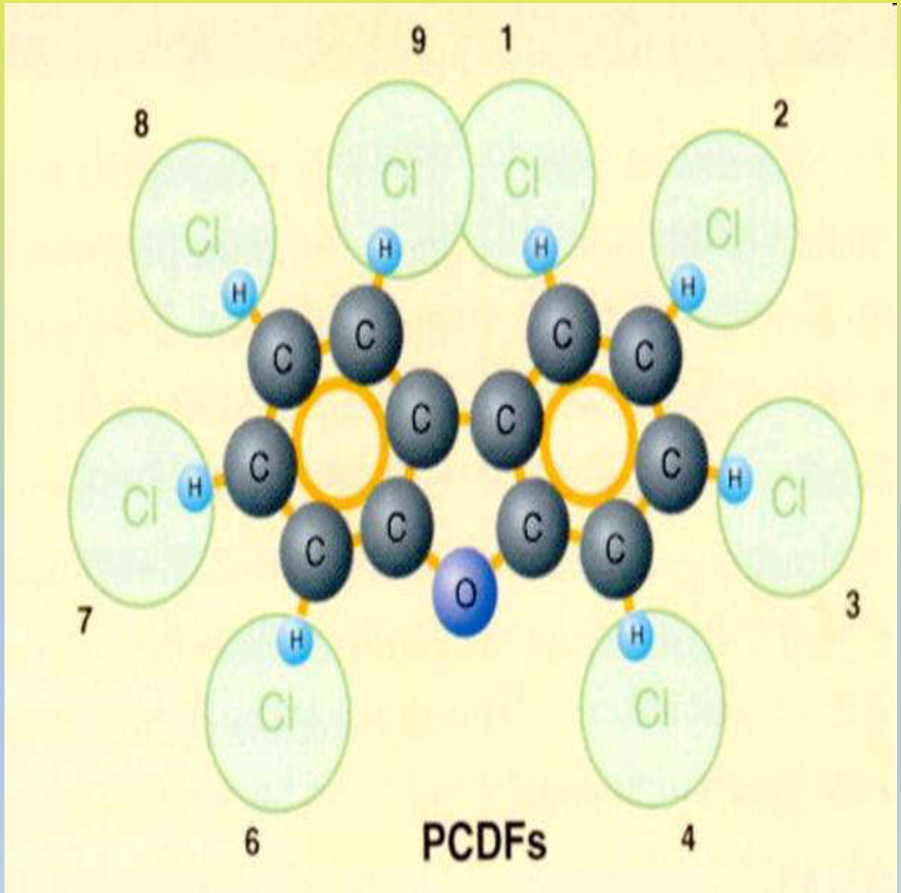
Pharmaceutical substances:
steroids

17-alpha-ethinylestradiol, 17-beta-estradiol EPA 1698

Hormon
Diclofenac EPA 542

Combustion by products: Dioxins and dioxin-like PCB-s
EPA 8280B





Congener	TEF value	Congener	TEF value
Dibenzo-p-dioxins (PCDDs)		**Dioxin-like PCBs: Non-ortho PCBs + Mono-ortho PCBs**	
2,3,7,8-TCDD	1		
1,2,3,7,8-PeCDD	1	*Non-ortho PCBs*	
1,2,3,4,7,8-HxCDD	0,1	PCB 77	0,0001
1,2,3,6,7,8-HxCDD	0,1	PCB 81	0,0001
1,2,3,7,8,9-HxCDD	0,1	PCB 126	0,1
1,2,3,4,6,7,8-HpCDD	0,01	PCB 169	0,01
OCDD	0,0001		
Dibenzofurans (PCDFs)		*Mono-ortho PCBs*	
2,3,7,8-TCDF	0,1	PCB 105	0,0001
1,2,3,7,8-PeCDF	0,05	PCB 114	0,0005
2,3,4,7,8-PeCDF	0,5	PCB 118	0,0001
1,2,3,4,7,8-HxCDF	0,1	PCB 123	0,0001
1,2,3,6,7,8-HxCDF	0,1	PCB 156	0,0005
1,2,3,7,8,9-HxCDF	0,1	PCB 157	0,0005
2,3,4,6,7,8-HxCDF	0,1	PCB 167	0,00001
1,2,3,4,6,7,8-HpCDF	0,01	PCB 189	0,0001
1,2,3,4,7,8,9-HpCDF	0,01		
OCDF	0,0001		

Abbreviations used: 'T' = tetra; 'Pe' = penta; 'Hx' = hexa; 'Hp' = hepta; 'O' = octa; 'CDD' = chlorodibenzodioxin; 'CDF' = chlorodibenzofuran; 'CB' = chlorobiphenyl.

<u>Inorganic components</u>: Elements of the periodical system-mainly not contaminats but geochemical (like soil) characterisation.
Suggested method: EN 21470-50:2006

2 g soil + 5 ml cc.HNO_3 +2 ml H_2O_2 ⟶ 50ml

Any detection method can be used, but please report:
- -traceability
- -validation
- -proficiency testing

What I dont plan:
1.Harmonize home made analytical methods-when we have internationally accepted method.
2.Analyses samples in a lab., which has not real possibility to get positive data.

SZENT ISTVÁN EGYETEM

Tasks I.

1.Please obtain the recommended methods.

2.Read carefully and make decision, are you able to fulfil all requirements, or you have to give the task to an accreditated lab. in the future.

3.Please let to know to……… until……………., who will do the analysis at home, who will give to accreditated lab.

4.Those who will do at home, let to know to………….., until……..what kind of Proficiency Test the lab past, or do the lab needs to participate in the future.

Tasks II: (As Analytical methods are in the middle beetwen Sampling and Evaluation)

Task for sampling:

On the basis of recomended Analytical method.

II.1. Pls calculate the amount of samples (how many grams from one sampling place)

II.2.Plan the physical condition of sampling and the shipment

Task for evaluation:

How many data is needed for evaluation.

SZENT ISTVÁN EGYETEM

Thank you for attention! Questions Please!

SZENT ISTVÁN EGYETEM

Participants	Suggested method for pesticide analysis
AITB-GBA	non
Bulgaria	VIM 1014/2010, EN ISO12918
Croatia	non
Hungary	WBSE-125:2016 GC-MS, WBSE-123:2016 LC-MS
Moldova	EPA 1699, EN ISO12918
Montenegro	non
Republika Srpska	EPA 508.1:1994
Romania	ISO 10382:2002
Slovakia	US EPA 8010 US EPA 8015
BH-Federation	EPA-508.1:1994
Slovenia, Ukraina	non