Interreg
Danube Transnational Programme
SIMONA

DRB BASELINE NETWORK FOR HSs SEDIMENT MONITORING

OUTPUT 3.4

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

Project title

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

Acronym

SIMONA

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Contents

1. INTRODUCTION

Output O.3.4 "DRB Baseline Network for HSs Sediment Monitoring" represents the finalization of SIMONA project WP3 activity 3.4"Evaluation of field data and implementing case studies". Every SIMONA partner country made the interpretation of the laboratory results (measured in both SIMONA Reference Laboratory – Balint Analitika Ltd. and country National Laboratory) of HSs in sediments (suspended, stream/bottom and active floodpain/overbank) sampled in two baseline network stations for sediment monitoring. Deliverables D.3.2.2 "Tables of sampling sites for DRB baseline network", D.3.3.3 "Sampling report collection of the 26 sampling sites from DRB baseline network" and D.3.3.4 "Laboratory report collection of the 26 sampling sites from DRB baseline network" presented in previous project periods all the stages of work, from the selection of the sampling sites, to the description of the sampling techniques and encountered problems till the tables of measured concentrations of HSs in the laboratories.

The interpretation of the laboratory results was based mainly on the SIMONA Evaluation Protocol, developed witin WP5 (Katalin Mária Dudás and Gyozo Jordan, the SIMONA Project Team. 2021). An Excel Tool was also developed, to allow risk ratio calculation based on Environmental Quality Standards (EQS) dossier (for stream/bottom sediments and suspended sediments) and other national Quality Standards (QS) limits (for stream/bottom sediments). For active floodplain/overbank sediments the comparison was made with the national standards for soils.

The Excel Tool contains at the moment of delivering this project only the national standards used for the interpretation of the 3 Test Areas Case Studies (Drava, Upper Tisa and South Danube), consisting of the national legislation Quality Limit values for HSs in the respective countries (Bulgaria, Hungary, Romania and Serbia), as well as other standards (Dutch Pollution List, Elbe Lower and Upper Limits, and US EPA).

Lists with HSs maximum allowable concentrations were provided for the other countries, such as Austria, Bosnia Herzegovina, Czech Republic, Slovakia and Slovenia and the values above these thresholds were highlighted.

The general situation of the sampled sediments in the baseline network stations is good. Where "bad" or "risky" status of sediments was encountered, a possible explanation was given. From metals, generally only Ni and Pb have higher values compared to EQS dossier or with some of the national standards. From organic substances, Fluoranthene occurs most often as being higher, as well as total PAHs. Pesticides were below detection limit in all countries.

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2. SIMONA EXCEL TOOL FOR EVALUATION OF HSs IN SEDIMENTS

For the sediments sampled at the two baseline network sites in each SIMONA country, the analytical results were determined by the Reference Laboratory Balint Analitika and National Laboratory and evaluated by calculating risk ratios (concentration/quality standard QS) based on some national or European legislations:

- *Evaluation I* is based EQS dossiers (dedicated to bottom and suspended sediments).

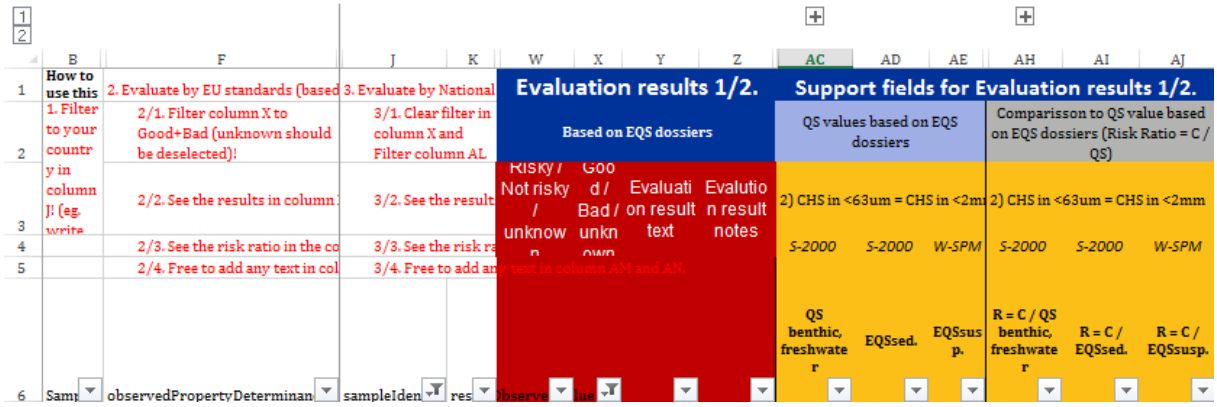

Fig. 2.1 Excel Tool for Evaluation I

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- *Evaluation II based on national standards:*

  - for stream/bottom sediments:

    - *Evaluation II "lower limit"* is based on Elbe basin (IKSE/ICPER 2018), US EPA, Serbia "Official Gazette of RS", No. 50/2012 for bottom sediment (comparison to lower limits).

    - *Evaluation II "intervention limit"* based on Elbe basin (IKSE/ICPER 2018), Rhine basin (ICPR, 2009), US EPA, Serbia "Official Gazette of RS", No. 50/2012, dedicated to bottom sediments (regarding maximum limits or interventions limits).

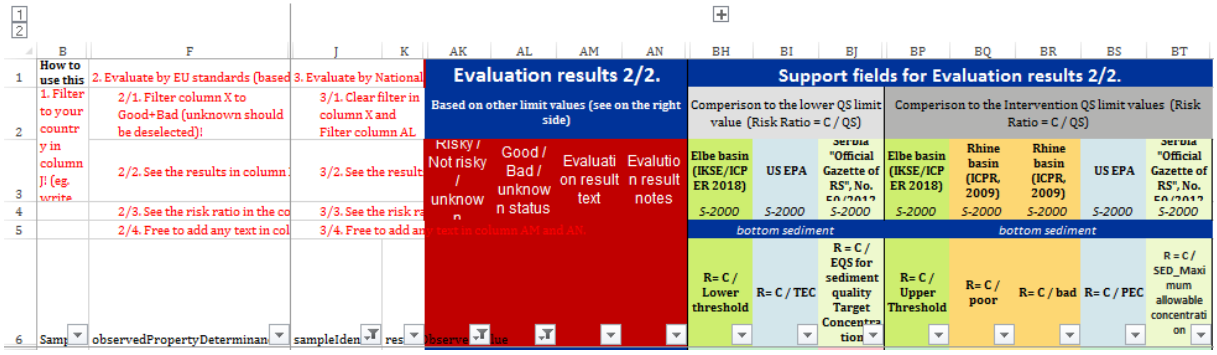

Fig. 2.2 Excel Tool for Evaluation II for bottom sediments "lower limit" (columns BH, BI and BJ in the Excel Tool); and"intervention limit" (columns BP, BQ, BR, BS and BT).

  - for floodplain sediments :

    - *Evaluation II "floodplain alert limits"* based on Dutch pollution list, Romanian legislation, Bulgarian legislation, Serbia "Official Gazette of RS", No. 30/2018 and 64/2019, dedicated to soils and floodplain sediments (regarding lower limit, or alert limits).

    - *Evaluation II "floodplain intervention limits"* based on Dutch pollution list, Hungarian legislation (6/2009 (IV. 14.), Romanian legislation, Bulgarian legislation, and 64/2019Serbia "Official Gazette of RS", No. 50/2012, dedicated to floodplain sediments regarding intervention limits.

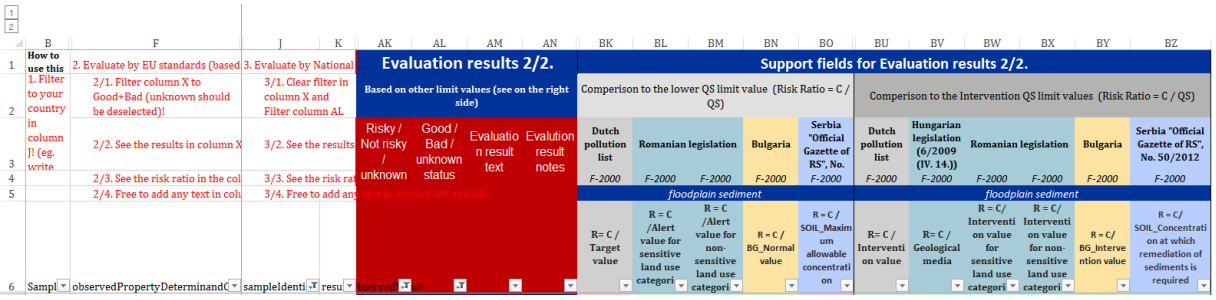

Fig. 2.3 Excel Tool for Evaluation II for floodplain sediments "lower limit" (columns BK, BL, BM, BN and BO in the Excel Tool); and"intervention limit" (columns BU, BV, BW, BX, BY and BZ).

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3. INTERPRETATION OF EVALUATION RESULTS FOR BASELINE STATIONS IN SIMONA COUNTRIES

3.1. AUSTRIA

Evaluation results based on EQS dossiers

For the samples taken at the two Austrian sites AT01 (Hainburg) and AT02 (Lavamünd), analytical results were determined by the reference laboratory Balint Analitika and evaluated by calculating risk ratios (= concentration / quality standard) based on EQS dossiers. Several parameters show risk ratios exceeding the value 1 (Fig. 3.1 and Table 3.1).

The risk ratios for lead and its compounds in bottom and suspended sediment samples at sample point AT02 are most likely a result of the numerous mining activities which took place in the catchment area in the past.

Risk ratios of organic compounds fluoranthene, benzopyrene, benzofluoranthene and total polycyclic aromatic hydrocarbons reach far higher values than observed values for lead. These compounds originate from pesticides and the interpretation of the observed values requires the expertise of environmental chemists. It can be noted that in general the risk ratios in suspended sediment are far higher than in bottom sediment.

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Table 3.1 Risk ratios based on the EQS dossiers; only values > 1 are shown

ObservedPropertyDeterminandCode	sample point AT01				sample point AT02			
	bottom sediment sample 01		bottom sediment sample 02		bottom sediment sample 01		bottom sediment sample 02	
	(S-2000 QS benthic, freshwater)	(S-2000 EQSsed.)	(S-2000 QS benthic, freshwater)	(S-2000 EQSsed)	(S-2000 QS benthic, freshwater)	(S-2000 EQSsed)	(S-2000 QS benthic, freshwater)	(S-2000 EQSsed)
CAS_206-44-0_Fluoranthene		24		19,8		2,9		1,3
CAS_50-32-8_Benzo(a)pyrene		4,7		4				
CAS_7439-92-1_Lead and its compounds							1,8	
EEA_32-23-5_Total Benzo(b)fluor-anthene (CAS_205-99-2) + Benzo(k)fluor-anthene (CAS_207-08-9)		9,5		7,9		1,2		
EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Benzo(b) fluoranthene, Benzo(k) fluoranthene, Benzo(ghi)perylene, Indeno(1,2,3-cd)pyrene)	2,4	23,6	1,9	19,4		3,1		1,5

ObservedPropertyDeterminandCode	sample point AT01		sample point AT02	
	suspended sediment barrel sample (W-SPM)	suspended sediment box sample (W-SPM)	suspended sediment barrel sample (W-SPM)	suspended sediment box sample (W-SPM)
CAS_206-44-0_Fluoranthene		18		18,3
CAS_50-32-8_Benzo(a)pyrene		39		36,3
CAS_7439-92-1_Lead and its compounds	1,7		3	1,3
EEA_32-23-5_Total Benzo(b)fluor-anthene (CAS_205-99-2) + Benzo(k)fluor-anthene (CAS_207-08-9)		83,5		77,7
EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Benzo(b) fluoranthene, Benzo(k) fluoranthene, Benzo(ghi)perylene, Indeno(1,2,3-cd)pyrene)		205		191,7

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A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AC	AD	AE	AH	AI	AJ
How to use this 'Evaluation sheet'?					2. Evaluate by EU standards (based on ES dossiers):				3. Evaluate by National standards (based on ES dossiers):													Evaluation results 1/2.				Support fields for Evaluation results 1/2.					
					2/1. Filter column X to Good+Bad (unknown should be deselected)!				3/1. Clear filter in column X and Filter column AL to Good+Bad (unknown should be deselected)!													Based on EQS dossiers				QS values based on EQS dossiers			Comparisson to QS value based on EQS dossiers (Risk Ratio = C / QS)		
1. Filter to your country in column J! (eg. write "HU" or "RO")					2/2. See the results in column X! (Good/Bad)				3/2. See the results in column AL! (Good/Bad)													Risky / Not risky / unknown	Good / Bad / unkn own	Evaluation result text	Evaluation result notes	2) CHS in <63um = CHS in <2mm			2) CHS in <63um = CHS in <2mm		
					2/3. See the risk ratio in the column AH-AI!				3/3. See the risk ratio in the column BH-BZ! (See used standar																	QS benthic, freshwater	EQSsed.	EQSsusp.	R = C / QS benthic, freshwater	R = C / EQSsed.	R = C / EQSsusp.
					2/4. Free to add any text in column Y and Z.				3/4. Free to add any text in column AM and AN.																	S-2000	S-2000	W-SPM	S-2000	S-2000	W-SPM
No	Sam				observedPropertyDeterminant	proce	result	phen	sampleIde	rest	rest	pro	pl		Remark																	
307	301	Reflab_	m	Pr	RVCAS_50-32-8_Benzo(a)pyrene	W-SPM	mg/kg	missing	AT02 SS BOX	0.05	false		0	unkn	-		A	Reflab.sai	Risky	Bad							0,0915	0,00707	0,001	not relevant	not relevant	36,59506762
314	308	Reflab_	m	Pr	RVCAS_50-32-8_Benzo(a)pyrene	W-SPM	mg/kg	missing	AT01 SS BOX	0.05	false		0	unkn	-		A	Reflab.sai	Risky	Bad							0,0915	0,00707	0,001	not relevant	not relevant	38,98170247
331	325	Reflab_	m	Pr	RVEEA_32-23-5_Total Benzo(b)fluor	S-2000	mg/kg	missing	AT01 BS 02	0.05	false		0	unkn	5		A	Reflab.sai	Risky	Bad							0,0675	0,00675	0,001	0,7851851852	7,851851852	not relevant
347	341	Reflab_	m	Pr	RVCAS_206-44-0_Fluoranthene	S-2000	mg/kg	missing	AT01 BS 02	0.06	false		0	unkn	5		A	Reflab.sai	Risky	Bad							2	0,00308	0,006	0,0305	19,80519481	not relevant
355	349	Reflab_	m	Pr	RVEEA_32-23-5_Total Benzo(b)fluor	S-2000	mg/kg	missing	AT01 BS 01	0.06	false		0	unkn	5		A	Reflab.sai	Risky	Bad							0,0675	0,00675	0,001	0,948148148	9,481481481	not relevant
371	365	Reflab_	m	Pr	RVCAS_206-44-0_Fluoranthene	S-2000	mg/kg	missing	AT01 BS 01	0.07	false		0	unkn	5		A	Reflab.sai	Risky	Bad							2	0,00308	0,006	0,037	24,02597403	not relevant
411	405	Reflab_	m	Pr	RVEEA_32-23-5_Total Benzo(b)fluor	W-SPM	mg/kg	missing	AT02 SS BOX	0.09	false		0	unkn	-		A	Reflab.sai	Risky	Bad							0,0675	0,00675	0,001	not relevant	not relevant	77,68595041
427	421	Reflab_	m	Pr	RVEEA_32-23-5_Total Benzo(b)fluor	W-SPM	mg/kg	missing	AT01 SS BOX	0.1	false		0	unkn	-		A	Reflab.sai	Risky	Bad							0,0675	0,00675	0,001	not relevant	not relevant	83,47107438
440	434	Reflab_	m	Pr	RVCAS_206-44-0_Fluoranthene	W-SPM	mg/kg	missing	AT01 SS BOX	0.11	false		0	unkn	-		A	Reflab.sai	Risky	Bad							2	0,00308	0,006	not relevant	not relevant	17,96397317
445	439	Reflab_	m	Pr	RVCAS_206-44-0_Fluoranthene	W-SPM	mg/kg	missing	AT02 SS BOX	0.11	false		0	unkn	-		A	Reflab.sai	Risky	Bad							2	0,00308	0,006	not relevant	not relevant	18,29358736
1347	1341	Reflab_	m	Pr	RVCAS_7439-92-1_Lead and its comp	W-SPM	mg/kg	missing	AT02 SS BOX	29.4	false		0.01	unkn	-		A	Reflab.sai	Risky	Bad							41	131	23	not relevant	not relevant	1,27826087
1439	1433	Reflab_	m	Pr	RVCAS_7439-92-1_Lead and its comp	W-SPM	mg/kg	missing	AT01 SS BARI	39.4	false		0.01	unkn	-		A	Reflab.sai	Risky	Bad							41	131	23	not relevant	not relevant	1,713043478
1595	1589	Reflab_	m	Pr	RVCAS_7439-92-1_Lead and its comp	W-SPM	mg/kg	missing	AT02 SS BARI	68.9	false		0.01	unkn	-		A	Reflab.sai	Risky	Bad							41	131	23	not relevant	not relevant	2,995652174
1612	1606	Reflab_	m	Pr	RVCAS_7439-92-1_Lead and its comp	S-2000	mg/kg	missing	AT02 BS 02	74.9	false		0.01	unkn	5		A	Reflab.sai	Risky	Bad							41	131	23	1,826829268	0,571755725	not relevant
3568	Added_4	Reflab_	m	Pr	RVEEA_33-56-7_Total PAHs (Benzo(	S-2000	mg/kg	missing	AT01 BS 01	0.16	false		0	unkn	5		A	Reflab.sai	Risky	Bad							0,0675	0,00675	0,001	2,355555556	23,55555556	not relevant
3569	Added_4	AT01 B	m	Pr	RVEEA_33-56-7_Total PAHs (Benzo(	S-2000	mg/kg	missing	AT01 BS 02	0.13	false		0	unkn	5		A	Reflab.sai	Risky	Bad							0,0675	0,00675	0,001	1,940740741	19,40740741	not relevant
3576	Added_4	AT01 S	m	Pr	RVEEA_33-56-7_Total PAHs (Benzo(	W-SPM	mg/kg	missing	AT01 SS BOX	0.25	false		0	unkn	-		A	Reflab.sai	Risky	Bad							0,0675	0,00675	0,001	not relevant	not relevant	204,9586777
3577	Added_4	AT02 B	m	Pr	RVEEA_33-56-7_Total PAHs (Benzo(	S-2000	mg/kg	missing	AT02 BS 01	0.02	false		0	unkn	5		A	Reflab.sai	Risky	Bad							0,0675	0,00675	0,001	0,3111111111	3,111111111	not relevant
3578	Added_4	AT02 B	m	Pr	RVEEA_33-56-7_Total PAHs (Benzo(	S-2000	mg/kg	missing	AT02 BS 02	0.01	false		0	unkn	5		A	Reflab.sai	Risky	Bad							0,0675	0,00675	0,001	0,148148148	1,481481481	not relevant
3583	Added_4	AT02 S	m	Pr	RVEEA_33-56-7_Total PAHs (Benzo(	W-SPM	mg/kg	missing	AT02 SS BOX	0.23	false		0	unkn	-		A	Reflab.sai	Risky	Bad							0,0675	0,00675	0,001	not relevant	not relevant	191,7355372

Fig. 3.11 Evaluation based on EQS dossiers in Austria

Evaluation results based on other limit values

If other, national QS limit values, esp. from Romania, Bulgaria, Serbia or Hungary, are used for comparison, lead, zinc, arsenic, mercury and cadmium risk ratios exceed the value of 1 in floodplain sediment samples at site AT01 and AT02, both in top and bottom samples.

In Austria, no environmental quality standards have been set for sediments. For the purpose of recording long-term trends in accordance with Directive 2008/105/EC, sediment and biota (fish) are additionally measured at 5 monitoring sites on a regular basis. Sediment and biota (fish) are additionally analysed with regard to the priority substances listed in the Directive that tend to accumulate in sediments and/or biota. The substances currently being investigated include polyaromatic hydrocarbons (PAHs) and various heavy metals (including mercury). This trend monitoring program is to be carried out in a 3-year cycle.

Regarding water and biota quality results in Austria, the Federal Ministry for Agriculture, Regions and Tourism publishes "water quality survey annual reports" of the regular water monitoring in cooperation with the Environment Agency Austria. The corresponding monitoring datasets are available online in public databases. In the annual reports an overview of results and problems is provided (i.e. https://info.bmlrt.gv.at/themen/wasser/wasserqualitaet/jahresbericht_2016-2018.html). There exists also a biota monitoring report (https://info.bmlrt.gv.at/service/publikationen/wasser/Fisch-Untersuchungsprogramm-2013.html). For the year 2021, these reports are not yet available.

The legal basis for the monitoring programme itself (monitoring sites, scope of monitoring, frequency of monitoring and selection of parameters) is the Ordinance on the Monitoring of the Status of Water Bodies (Gewässerzustandsüberwachungsverordnung - GZÜV) 2006 as amended, which implements the European Water Framework Directive (WFD, 2000/60/EC) and the National Water Act 1959 as amended. The criteria for the status assessment of the designated water bodies are regulated separately by the respective Quality Objectives Ordinances for Groundwater and Surface Waters.

In order to investigate pollutants that are not covered by the Ordinance on the Monitoring of the Status of Water Bodies and to clarify specific questions on environmental behaviour and the interaction of different substances and substance compounds in water bodies, the ordinance stipulates that special monitoring programmes can be carried out for a limited period of time. The recent risk analysis and the results of the status assessment can be found in the draft of the national water management plan (https://info.bmlrt.gv.at/themen/wasser/wisa/ngp/entwurf-ngp-2021.html).

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3.2. BOSNIA AND HERZEGOVINA

Sediment samples collected in Bosnia and Herzegovina from two national sampling stations (Karanovac on the river Spreča and Rudanka on the river Bosna) were analyzed in the reference Laboratory (Balint Analitika from Budapest, Hungary) and, at the state level, in the Laboratory of the Federal Institute of Agropedology.

The results of the analyses performed in both laboratories are approximatively similar. It should be noted that the legislation in Bosnia and Herzegovina related to the quality of surface water sediments has not yest been adopted.

Brief analysis of results from Station1 (Karanovac)

From the results of heavy metal measurements, "bad staus" appears for nickel, chromium and mercury (Fig. 3.2). In the Spreča river basin, upstream of the sampling point, ultrabasic rocks are significantly present. Therefore, we can expect increased concentrations of nickel and chromium in the samples, so we can assume that these are natural causes. When it comes to the increased concentration of mercury in the sedimnets, we assume that this is due to the anthropogenic factor, especially if we take into account the industrial plants located upstream of the sampling point Karadovac.

Also, the increased contents of PAHs (Anthracene, Flouranthene, Benzo(a)pyrene, Benzo(b)fluoranthene + Benzo(k)fluoranthene, Benzo(g, h, i)perylene and Indeno(1,2,3-cd)pyrene) can certainly be attributed to the anthropogenic factor, i.e. industrial wastewater.

Brief analysis of results from Station2 (Rudanka)

Sampling staion 2 is located downstream of sampling station 1, because the river Spreča is a tributary of river Bosna.

The increased contents of heavy metals nickel and chromium at Point 2 can be attributed to natural factors in the form of rocks of ultrabasic composition located upstream of the site. However, the increased contents of lead and mercury are associated with the discharge of industrial wastewater into the Bosna River and its tributaries (primarily the Spreča River).

The increased contents of PAHs in the samples from Point 2, as in the case of samples from Point 1, can be primarily associated with industrial wastewater. Thease are the following PAHs: Anthracene, Flouranthene, Benzo(a)pyrene, Benzo(b)fluoranthene + Benzo(k)fluoranthene, Benzo(g, h, i)perylene and Indeno(1,2,3-cd)pyrene.

By analyzing, we find out that on Point 2 (Rudanka) in the sediments of the river Bosna, the contents of the mentioned PAHs are up to several times lower than in the sediments of the river Spreča on Point 1 (Karanovac). We can conclude that the vast majority of PAHs are brought to the Bosna River by the Spreča River. The short conclusion is that the sources of PAH pollution should be sought in the Spreča river basin upstream of the sampling site 1.

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Fig. 3.2 Substances over the

PROJECT	Country	Sample ID	Sample type	Component tested	Concentration mesured (Ref. Lab.)	Standard method applied (Ref. Lab.)	Concentration mesured (Nat. Lab.)	Standard method applied (Nat. Lab.)	Unit		National point (River), type of sediments	Possible origin of pollution
SIMONA	Bosnia and Herzegovina	SBA02 SS/BR	suspended sediment	Ni	170	EPA 6020B:2014			mg/kg d.m.	Bad		Natural: Nickel is a component of ultrabasic rocks located upstream of the sampling point.
SIMONA	Bosnia and Herzegovina	SBA02 SS/BR	suspended sediment	Pb	46.8	EPA 6020B:2014			mg/kg d.m.	Bad		Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 SS/BR	suspended sediment	Anthracene	0.183	EPA 8270E:2018			mg/kg d.m.	Bad	Rudanka (Bosna),	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 SS/BR	suspended sediment	Fluoranthene	0.978	EPA 8270E:2018			mg/kg d.m.	Bad	Suspended	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 SS/BR	suspended sediment	Benzo(a)pyrene	0.367	EPA 8270E:2018			mg/kg d.m.	Bad	sediment	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 SS/BR	suspended sediment	Benzo(b)fluoranthene+Benzo(k)fluoranthene	1.68	EPA 8270E:2018			mg/kg d.m.	Bad		Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 SS/BR	suspended sediment	Benzo(g,h,i)perylene	0.195	EPA 8270E:2018			mg/kg d.m.	Bad		Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 SS/BR	suspended sediment	Ni	262	EPA 6020B:2014			mg/kg d.m.	Bad		Natural: Nickel is a component of ultrabasic rocks located upstream of the sampling point.
SIMONA	Bosnia and Herzegovina	SBA01 SS/BR	suspended sediment	Anthracene	0.846	EPA 8270E:2018			mg/kg d.m.	Bad	Karanovac	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 SS/BR	suspended sediment	Fluoranthene	4.16	EPA 8270E:2018			mg/kg d.m.	Bad	(Spreča),	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 SS/BR	suspended sediment	Benzo(a)pyrene	1.83	EPA 8270E:2018			mg/kg d.m.	Bad	Suspended	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 SS/BR	suspended sediment	Benzo(b)fluoranthene+Benzo(k)fluoranthene	4.36	EPA 8270E:2018			mg/kg d.m.	Bad	sediment	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 SS/BR	suspended sediment	Benzo(g,h,i)perylene	0.938	EPA 8270E:2018			mg/kg d.m.	Bad		Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 BS DR	bottom sediment	Cr	187	EPA 6020B:2014	149.5	BAS ISO 11047	mg/kg d.m.	Bad		Natural: Chrome is a component of ultrabasic rocks located upstream of the sampling point.
SIMONA	Bosnia and Herzegovina	SBA02 BS DR	bottom sediment	Ni	184	EPA 6020B:2014	197.4	BAS ISO 11047	mg/kg d.m.	Bad		Natural: Nickel is a component of ultrabasic rocks located upstream of the sampling point.
SIMONA	Bosnia and Herzegovina	SBA02 BS DR	bottom sediment	Anthracene	0.08	EPA 8270E:2018	0.093	BAS ISO 18287	mg/kg d.m.	Bad	Rudanka	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 BS DR	bottom sediment	Fluoranthene	0.364	EPA 8270E:2018	0.309	BAS ISO 18287	mg/kg d.m.	Bad	(Bosna),	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 BS DR	bottom sediment	Benzo(a)pyrene	0.136	EPA 8270E:2018	0.123	BAS ISO 18287	mg/kg d.m.	Bad	Bottom	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 BS DR	bottom sediment	Benzo(b)fluoranthene+Benzo(k)fluoranthene	0.251	EPA 8270E:2018	0.267	BAS ISO 18287	mg/kg d.m.	Bad	sediment	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 BS DR	bottom sediment	Benzo(g,h,i)perylene	0.078	EPA 8270E:2018	0.069	BAS ISO 18287	mg/kg d.m.	Bad		Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 BS DR	bottom sediment	Indeno(1,2,3-cd)pyrene	0.135	EPA 8270E:2018	0.134	BAS ISO 18287	mg/kg d.m.	Bad		Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 BS	bottom sediment	Cr	339	EPA 6020B:2014	194.2	BAS ISO 11047	mg/kg d.m.	Bad		Natural: Chrome is a component of ultrabasic rocks located upstream of the sampling point.
SIMONA	Bosnia and Herzegovina	SBA01 BS	bottom sediment	Hg	0.48	EPA 6020B:2014	0.255	by dry combus	mg/kg d.m.	Bad		Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 BS	bottom sediment	Ni	260	EPA 6020B:2014	263.1	BAS ISO 11047	mg/kg d.m.	Bad	Karanovac	Natural: Nickel is a component of ultrabasic rocks located upstream of the sampling point.
SIMONA	Bosnia and Herzegovina	SBA01 BS	bottom sediment	Anthracene	0.669	EPA 8270E:2018	0.697	BAS ISO 18287	mg/kg d.m.	Bad	(Spreča),	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 BS	bottom sediment	Fluoranthene	3.86	EPA 8270E:2018	2.866	BAS ISO 18287	mg/kg d.m.	Bad	Bottom	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 BS	bottom sediment	Benzo(a)pyrene	1.73	EPA 8270E:2018	1.77	BAS ISO 18287	mg/kg d.m.	Bad	sediment	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 BS	bottom sediment	Benzo(b)fluoranthene+Benzo(k)fluoranthene	3.69	EPA 8270E:2018	3.114	BAS ISO 18287	mg/kg d.m.	Bad		Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 BS	bottom sediment	Benzo(g,h,i)perylene	1.56	EPA 8270E:2018	1.603	BAS ISO 18287	mg/kg d.m.	Bad		Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 BS	bottom sediment	Indeno(1,2,3-cd)pyrene	2.26	EPA 8270E:2018	1.886	BAS ISO 18287	mg/kg d.m.	Bad		Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 FSSP/BS	soil	Cr	390	EPA 6020B:2014	182.2	BAS ISO 11047	mg/kg d.m.	Bad		Natural: Chrome is a component of ultrabasic rocks located upstream of the sampling point.
SIMONA	Bosnia and Herzegovina	SBA02 FSSP/BS	soil	Ni	209	EPA 6020B:2014	224.6	BAS ISO 11047	mg/kg d.m.	Bad	Rudanka	Natural: Nickel is a component of ultrabasic rocks located upstream of the sampling point.
SIMONA	Bosnia and Herzegovina	SBA02 FSSP/BS	soil	Fluoranthene	1.73	EPA 8270E:2018	1.547	BAS ISO 18287	mg/kg d.m.	Bad	(Bosna),	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 FSSP/BS	soil	Benzo(a)pyrene	0.645	EPA 8270E:2018	0.627	BAS ISO 18287	mg/kg d.m.	Bad	Floodplain	Anthropogenic: industrial wastewater during flooding of floodplains
SIMONA	Bosnia and Herzegovina	SBA02 FSSP/BS	soil	Benzo(b)fluoranthene+Benzo(k)fluoranthene	1.05	EPA 8270E:2018	0.953	BAS ISO 18287	mg/kg d.m.	Bad	sediment -	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 FSSP/BS	soil	Benzo(g,h,i)perylene	0.377	EPA 8270E:2018	0.384	BAS ISO 18287	mg/kg d.m.	Bad	bottom soil	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 FSSP/BS	soil	Indeno(1,2,3-cd)pyrene	0.66	EPA 8270E:2018	0.638	BAS ISO 18287	mg/kg d.m.	Bad		Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 FSSP/TS	soil	Cr	438	EPA 6020B:2014	259.3	BAS ISO 11047	mg/kg d.m.	Bad		Natural: Chrome is a component of ultrabasic rocks located upstream of the sampling point.
SIMONA	Bosnia and Herzegovina	SBA02 FSSP/TS	soil	Hg	0.33	EPA 6020B:2014	0.064	by dry combus	mg/kg d.m.	Bad		Anthropogenic: industrial wastewater during flooding of floodplains
SIMONA	Bosnia and Herzegovina	SBA02 FSSP/TS	soil	Ni	230	EPA 6020B:2014	251.5	BAS ISO 11047	mg/kg d.m.	Bad	Rudanka	Natural: Nickel is a component of ultrabasic rocks located upstream of the sampling point.
SIMONA	Bosnia and Herzegovina	SBA02 FSSP/TS	soil	Fluoranthene	1.09	EPA 8270E:2018	0.896	BAS ISO 18287	mg/kg d.m.	Bad	(Bosna),	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 FSSP/TS	soil	Benzo(a)pyrene	0.387	EPA 8270E:2018	0.321	BAS ISO 18287	mg/kg d.m.	Bad	Floodplain	Anthropogenic: industrial wastewater during flooding of floodplains
SIMONA	Bosnia and Herzegovina	SBA02 FSSP/TS	soil	Benzo(b)fluoranthene+Benzo(k)fluoranthene	0.626	EPA 8270E:2018	0.59	BAS ISO 18287	mg/kg d.m.	Bad	sediment -	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 FSSP/TS	soil	Benzo(g,h,i)perylene	0.225	EPA 8270E:2018	0.201	BAS ISO 18287	mg/kg d.m.	Bad	top soil	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA02 FSSP/TS	soil	Indeno(1,2,3-cd)pyrene	0.376	EPA 8270E:2018	0.352	BAS ISO 18287	mg/kg d.m.	Bad		Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/BS	soil	Cr	481	EPA 6020B:2014	225	BAS ISO 11047	mg/kg d.m.	Bad		Natural: Chrome is a component of ultrabasic rocks located upstream of the sampling point.
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/BS	soil	Hg	1.56	EPA 6020B:2014	0.627	by dry combus	mg/kg d.m.	Bad		Anthropogenic: industrial wastewater during flooding of floodplains
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/BS	soil	Ni	312	EPA 6020B:2014	322.7	BAS ISO 11047	mg/kg d.m.	Bad	Karanovac	Natural: Nickel is a component of ultrabasic rocks located upstream of the sampling point.
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/BS	soil	Anthracene	1.1	EPA 8270E:2018	0.938	BAS ISO 18287	mg/kg d.m.	Bad	(Spreča),	Anthropogenic: industrial wastewater during flooding of floodplains
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/BS	soil	Fluoranthene	5.28	EPA 8270E:2018	4.81	BAS ISO 18287	mg/kg d.m.	Bad	Floodplain	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/BS	soil	Benzo(a)pyrene	2.75	EPA 8270E:2018	2.431	BAS ISO 18287	mg/kg d.m.	Bad	sediment -	Anthropogenic: industrial wastewater during flooding of floodplains
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/BS	soil	Benzo(b)fluoranthene+Benzo(k)fluoranthene	4.97	EPA 8270E:2018	4.168	BAS ISO 18287	mg/kg d.m.	Bad	bottom soil	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/BS	soil	Benzo(g,h,i)perylene	1.71	EPA 8270E:2018	1.357	BAS ISO 18287	mg/kg d.m.	Bad		Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/BS	soil	Indeno(1,2,3-cd)pyrene	3.18	EPA 8270E:2018	2.561	BAS ISO 18287	mg/kg d.m.	Bad		Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/TS	soil	Cr	541	EPA 6020B:2014	212.8	BAS ISO 11047	mg/kg d.m.	Bad		Natural: Chrome is a component of ultrabasic rocks located upstream of the sampling point.
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/TS	soil	Hg	0.71	EPA 6020B:2014	0.271	by dry combus	mg/kg d.m.	Bad		Anthropogenic: industrial wastewater during flooding of floodplains
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/TS	soil	Ni	374	EPA 6020B:2014	401.9	BAS ISO 11047	mg/kg d.m.	Bad	Karanovac	Natural: Nickel is a component of ultrabasic rocks located upstream of the sampling point.
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/TS	soil	Anthracene	1.26	EPA 8270E:2018	1.114	BAS ISO 18287	mg/kg d.m.	Bad	(Spreča),	Anthropogenic: industrial wastewater during flooding of floodplains
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/TS	soil	Fluoranthene	6.18	EPA 8270E:2018	5.23	BAS ISO 18287	mg/kg d.m.	Bad	Floodplain	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/TS	soil	Benzo(a)pyrene	2.92	EPA 8270E:2018	2.622	BAS ISO 18287	mg/kg d.m.	Bad	sediment -	Anthropogenic: industrial wastewater during flooding of floodplains
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/TS	soil	Benzo(b)fluoranthene+Benzo(k)fluoranthene	5.27	EPA 8270E:2018	4.871	BAS ISO 18287	mg/kg d.m.	Bad	top soil	Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/TS	soil	Benzo(g,h,i)perylene	1.74	EPA 8270E:2018	1.444	BAS ISO 18287	mg/kg d.m.	Bad		Anthropogenic: industrial wastewater
SIMONA	Bosnia and Herzegovina	SBA01 FSSP/TS	soil	Indeno(1,2,3-cd)pyrene	3.19	EPA 8270E:2018	2.774	BAS ISO 18287	mg/kg d.m.	Bad		Anthropogenic: industrial wastewater

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3.3. BULGARIA

BG-01 Silistra at Danube old port

PAHs

Laboratory results from bottom sediment and suspended sediment

At this monitoring site, some PAH concentrations measured in the river *bottom sediment* are below the considered quality standards and the laboratory results are <LOQ or =LOQ. However, Fluoranthene concentrations are 30 times higher than the EQSsed and evaluated as risky. Samples from the Danube profile at Silistra sampled by RO-IGR Romanian partner are in accordance with the samples from the old port and reveal values that are up to 5.8 and 2.8 times higher than the EQSsed (right side) for the same hazardous substances. Also, the EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(ghi)perylene, Indeno(1,2,3-cd)pyrene) exceed the EQSsed (5.33 times the concentration in the National laboratory and 4.40 times the values of the Reference laboratory).

In the river *suspended sediments* from the PAHs the Fluoranthene is in a risky status, although in lower concentrations – 10 R (R = C / EQSsusp.) in the sample at the old port. However, at Danube, right bank (sampled by RO-IGR) it is 14.2 times higher than the EQSsusp. Other hazardous substances in risky concentration are EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(ghi)perylene, Indeno(1,2,3-cd)pyrene) with R = 18.18. In the sample of SS from the whole water column, taken by the RO-IGR these substances revealed a very high R=67.

Based on bottom and suspended sediment results at Silistra monitoring site, there is hazard for damages to the benthics or water related ecosystem at the time of sampling. These results of HS concentration measurements are very good indicators for the current pollution activity, therefore, checking for active PAH sources in the monitored water body is highly recommended.

Laboratory results from floodplain sediment

The evaluation of the floodplain sediments is made using the Bulgarian normal and intervention soil values. The concentrations of Fluoranthene are very risky at R70 to 120. Benzo(a)pyrene and Benzo(g,h,i)perylene are also exceeding the normal values in the bottom (40-50cm)cand top soil (0-5cm), respectively. Based on the overbank sediment samples at Silistra monitoring site, there is hazard by the overbank soils at the time of sampling.

Conclusions for PAHs

The concentrations above the LOQ measured in the top soil floodplain sediment, and the values above the EQS values in water suspended particular matter indicate some active pollution sources in the monitored water body and thus hazard from PAHs. The national monitoring system has also selected this site for regular biota monitoring to detect PAH problems, but here we will suggest regular SPM monitoring, too. In WP8, Silistra was a test site for passive sediment sampling and the results will be used to define the proper monitoring frequency.

Heating (burning wood, pallet or gas) of households is partly responsible for the observed elevated PAH concentrations because the sampling time was at the end of April, at the end of the

winter heating period. Other possible sources might be related to industrial wastewater discharge and naval traffic.

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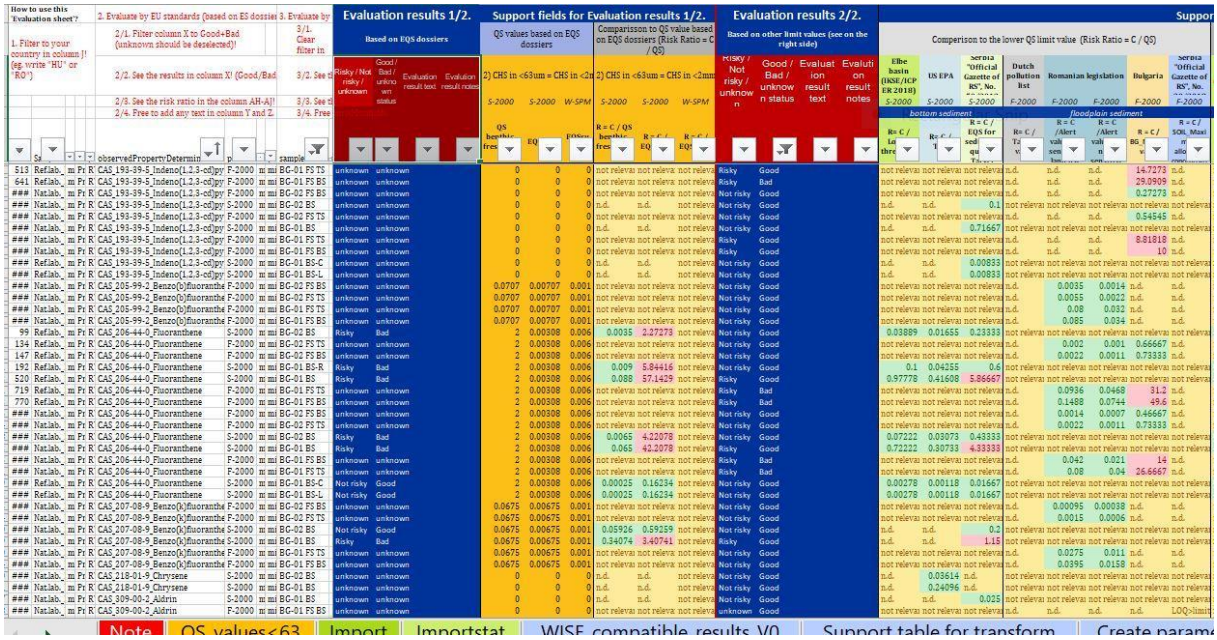

Fig. 3.3.1. Evaluation of PAHs measured in the bottom sediment (S-2000) and suspended sediment (W-SPM), and measured in the floodplain sediment (Bulgaria – normal soil values) at Silistra monitoring site.

Pesticides

Laboratory results from bottom sediment and suspended sediment

Concentration of Hexachlorocyclohexane and Quinoxyfen in bottom sediment and suspended sediment (SPM) measured in the reference laboratory are all below LOQ. Based on the bottom sediment results at Silistra monitoring site, there is no hazard for the benthics or water related ecosystems from these pesticides at the time of sampling.

Concentration of dicofol, hexachlorobenzene, heptachlor and heptachlor epoxide were also below LOQ, but the EQS are very low, therefore the hazard cannot be evaluated. Based on US EPA PEC value, the Elbe, the Rhine basin and the Serbian thresholds the benthics and water related ecosystem are not at risk.

Laboratory results from floodplain sediment

Most of the Danube Countries have no quality standards for WFD pesticides. All laboratory results were under LOQ values, so there is no reason to protect water quality via overbank sediment for pesticides.

Conclusions for pesticides

Based on sediment results, there is no need for detailed monitoring for the selected pesticides from sediment at this site, the biota and passive membrane sampling methods should be sufficient.

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Metals

Laboratory results from bottom sediment and suspended sediment

EQSsed and EQSsusp were delivered based on EQS dossiers data. Due to active mining activity In Bulgaria and the neighboring countries it was expected to detect higher concentrations compared with the EQSs. However, in the *bottom sediments* no one of the monitored elements exceed the EQSs. Based on the results of the BN sampling at Silistra monitoring site, there is no hazard for any damages for the benthics or water related ecosystems from these metals at the time of sampling. Mercury, arsenic, cadmium, lead, copper, nickel, zink, chromium results indicates some detectible concentrations but stay also below the Bulgarian threshold for normal soil.

In the suspended sediment samples the status is similar, only for lead the concentration exceeds the EQSsusp 1.71 time at the Silistra – right bank site (sample taken by RO-IGR from 3 levels of the water column).

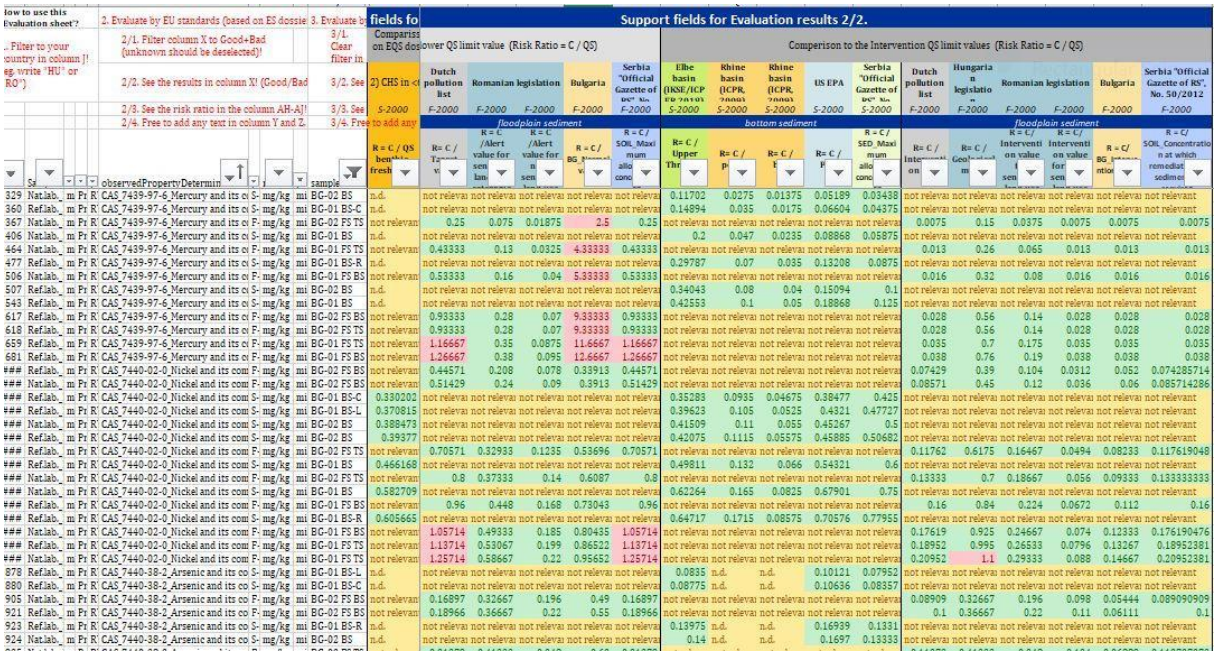

Fig. 3.3.2. Evaluation of Metals measured in the bottom sediment (S-2000), suspended sediment (W-SPM) and in the floodplain sediment (F-2000) and Bulgarian EQSs for soil at Silistra monitoring site. Red highlight indicates exceedance of EQS values.

Laboratory results from floodplain sediment

The metals from top and bottom soil floodplain sediments are above the Bulgarian EQSs for normal soil although not reaching the intervention threshold. The mercury is 2 and 9 time higher than the BG normal soil EQS depending on the laboratory of analyses and applied analytical techniques. It does not reach the intervention threshold.

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Conclusions for metals

Based on bottom, suspended and overbank sediment samples, there is moderate risk for the benthics or water related ecosystems from these metals at the time of sampling. The regular monitoring of metals, mainly for arsenic, mercury and cadmium is important, and trend evaluation is also suggested. The most suitable sediment matrix can be the bottom sediment, but the overbank/floodplain sediments should be also considered possible source of hazardous metals. Suspended sediment is from the other side the most dangerous for the benthics and passive sampling might be an appropriate solution.

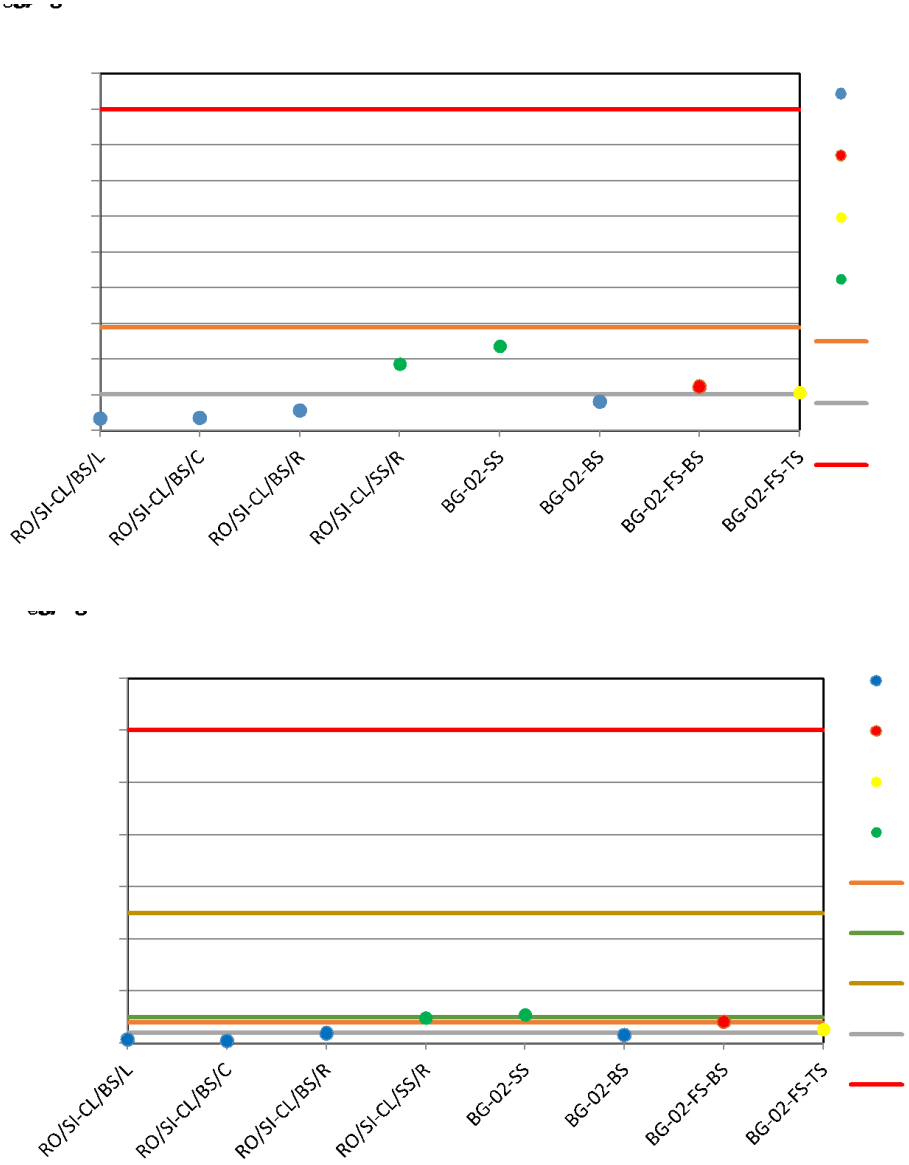

Fig. 3.3.3. Comparison of As and Cd measured at Silistra monitoring site in samples of the old port (BG-01), and from boat and on the Romanian side (samples taken by RO-IGR). BS-bottom sediment; FS-floodplain sediment (bottom and top soil), SS-suspended sediment.

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In the close area of the Danube River at Silistra, there is no obvious industrial source for metals. Furthermore, metals from the Bulgarian Danube river basin that are known for metal pollution (Ogosta and Iskar River) obviously settle their hazardous metals before, or close to the junction with the Danube River. Thus, other relevant emission sources should be monitored time-to-time, such as municipal and industrial wastewater treatment plants in the catchment. It is noted that the main source of cadmium is fertilizers used in the EU, and not industrial activities.

BG-02 YANTRA RIVER AT KARANTSI

PAHs

Laboratory results from bottom sediment, suspended sediment and floodplain sediment

Almost all PAHs from this monitoring site are close or slightly above the BG normal soil values. On the figure below we are providing a graph for the Fuoranthene and also show the tendencies in its variations comparing the values from October, 2020, and April, 2021 (data from the reference and the national laboratory)

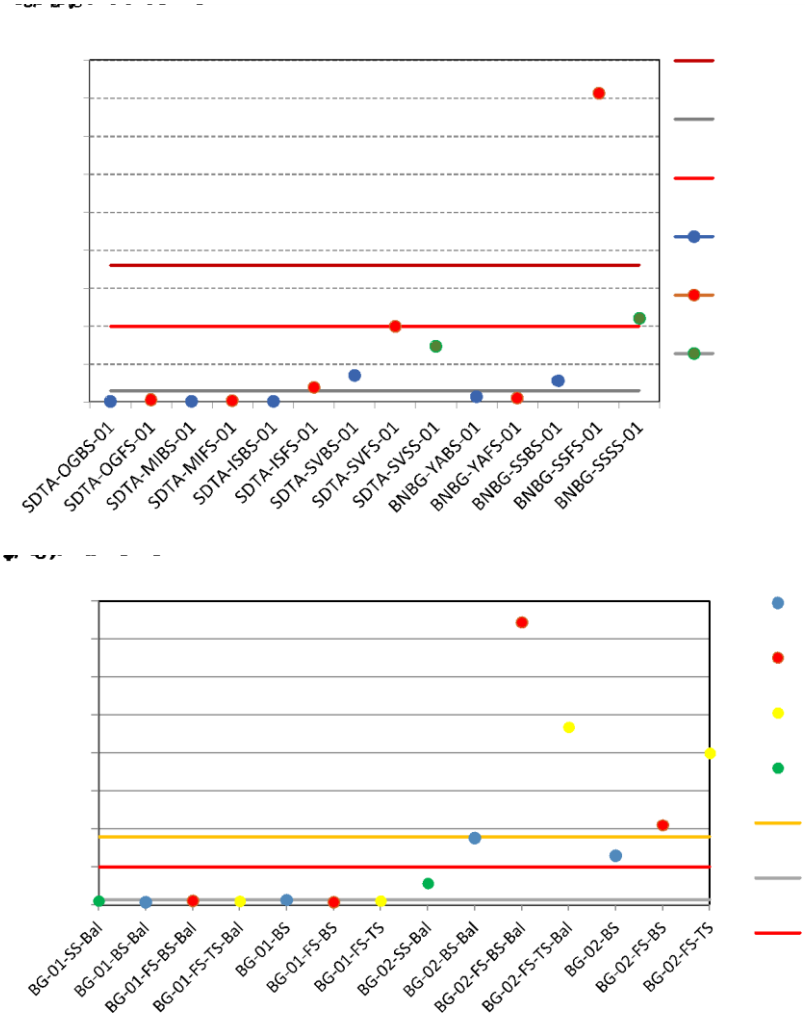

Fig. 3.3.4. Comparison of Fluoranthene measured at Yantra-Karantsi monitoring site in October, 2020 (points BNBG-YABS – bottom sediment and BNBG-YAFS – floodplain sediment 0-20 top cm; no SS at that sampling time), and in April, 2021 (data from reference and national laboratories). BG-02 data are from Silistra monitoring site. BS-bottom sediment; FS-floodplain sediment (bottom and top soil), SS-suspended sediment.

Conclusions for PAHs

The >LOQ concentrations in the overbank sediment soil samples, and the concentrations around the EQS in the water suspended sediment samples indicate some active pollution sources and low hazard from PAHs. The monitoring frequency may stay once per year.

Heating (burning wood, pallet or gas) of households might be responsible for the observed PAH concentrations above LOQ. Waste waters from industrial plants of the bigger cities along Yantra River (Veliko Tarnovo and Gabrovo) may also come into consideration as possible sources of contamination.

Pesticides

Laboratory results from bottom sediment suspended and floodplain sediment

Concentration of all measured substances in all three types of sediments are below LOQ. Conseqently, based on the results at the Yantra-Karantsi monitoring site, there is no hazard for the bethics or water related ecosystems from the pesticides at the time of sampling.

Metals

Laboratory results from bottom sediment, suspended sediment and floodplain sediment

EQSsed and EQSsusp for lead are shown on the Figure below, along with the USA and BG normal and intervention values. All measured Pb-concentrations are below the normal values and the EQSsed at Yantra-Karantsi site.

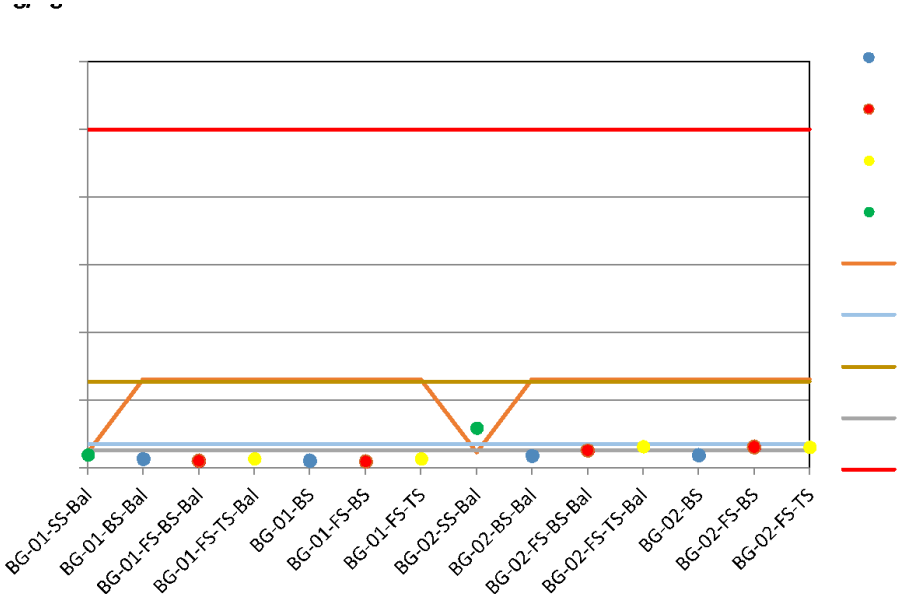

Fig. 3.3.5. Comparison of Lead measured at Yantra-Karantsi monitoring site in April, 2021 (data from reference and national laboratories). BG-02 data are from Silistra monitoring site. BS-bottom sediment; FS-floodplain sediment (bottom and top soil), SS-suspended sediment.

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Arsenic, mercury, cadmium, chromium, copper, zinc and nickel results do not indicate risk and the site is in good status for all metals.

Conclusions for metals

Based on bottom, suspended and floodplain sediment samples, there is no hazard for the benthics or water related ecosystems from these metals at the time of sampling. However, the regular monitoring of metals, mainly for lead, nickel, mercury and cadmium is important, and trend evaluation is also suggested.

Closing remarks for both Bulgarian sites

There is negligible or considerable uncertainty in the results reflected in the difference between the national and reference laboratory results. Therefore, for better risk assessment at least 3 sediment samples per year are required, and better laboratory intercalibration process for the HSs.

3.4 CROATIA

EU standards

HR01 – the Sutla river

Bottom sediment

At location HR01, according to EU standards (Fig. 3.4.1) national and reference laboratory analysis showed elevated concentrations of Fluoranthene in bottom sediment. In addition, national laboratory determined elevated concentrations of Benzo(a)pyrene, while reference laboratory determined elevated total concentrations of Benzo(b)fluoranthene + Benzo(k)fluoranthene.

Suspended sediment

Suspended sediment was analysed in reference laboratory only, due to small quantity of collected sediment using the barrel system. However, Fluoranthene was again elevated, but also was lead and its compounds.

HR02 – the Drava river

Bottom sediment

According tu EU standards, elevated concentrations of Fluoranthene in bottom sediment were determined by both, national and reference laboratories. At the same location, national laboratory measured elevated concentrations of Benzo(a)pyrene, while reference laboratory measured elevated total concentrations of Benzo(b)fluoranthene + Benzo(k)fluoranthene.

Suspended sediment

Suspended sediment was analysed in reference laboratory only, due to small quantity of collected sediment using the barrel system. However, Fluoranthene was again elevated, but also was lead and its compounds.

Conclusion

At both locations elevated concentrations of specific PAHs were determined by both, national and reference laboratories. The source of contamination is the most likely related to effluent water which is being discharged into the rivers. Moreover, elevated concentrations of lead and its compounds were determined by reference laboratory in suspended sediment. However, sources of lead might not be the same. In the case of Drava River, sources could be tied to natural mineralization and weathering of such rocks in the upper stream of the Drava River. Anthropogenic activites should not be excluded, since industrial and mining activities were also present in the upper part of the stream. In the case of Sutla River, sources of PAHs are probably the same, but lead and its compounds could be elevated due to the nearby traffic.

Floodplain sediments were not contaminated regarding any measured substance.

National standards

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

According to national standards (Fig. 3.4.2), floodplain sample (topsoil) at Sutla River was contaminated with elevated concentrations of Zinc and its compounds. More precisely, concentration of 201.36 mg/kg was measured by national laboratory only. Most likely, source of Zinc and its compounds was traffic, or more specifically rail traffic which used to be active over the bridge near the sampling site.

Fig

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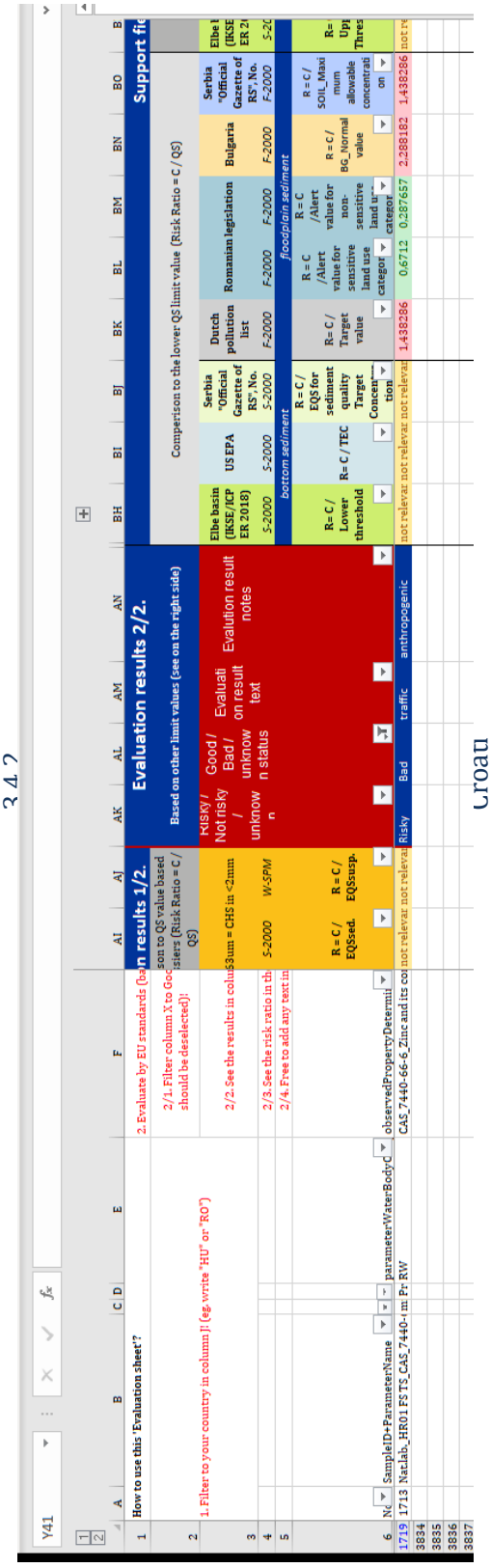

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3.5. CZECH REPUBLIC

In general, there is a long term problem with above limit values of polycyclic aromatic hydrocarbons (PAHs) in Czech Republic. This issue is caused by several factors:

i) local domestic heating by burning organic matter (in small villages or small towns) and industry
ii) ii) the particular terrain nearby or transboundary transport of pollution (PAHs in the air, wet or dry deposition)
iii) iii) wet or dry deposition in the landscape and after rainfall - the main part of PAHs enters streams or rivers through surface runoff
iv) iv) furthermore, PAHs may also originated from traffic.

Figure 3.5 shows the overpassed thresholds for PAHs in the baseline stations of Czech Republic according to EU dossiers, while the Czech national limites for HSs measured in SIMONA project are shown in Table 3.5.

Table 3.5. Limit values (in mg/kg of dry soil) according to the Law no. 153/2016 Sb.

hazardous substances	$pH/CaCl_2$	extraction use HNO_3+3HCl	extraction use HN_4NO_3
Zn	-	400	-
Ni	<6.5	150	20
	>6.5	200	
	-	-	1
Cu	< 5.0	150	-
	5.0 - 6.5	200	-
	> 6.5	300	-
	-	-	1

hazardous substances	value
As	40
Cd	20
Pb	400
Hg (total)	20
Benzo(a)pyrene	0.5
∑PAU	30.0
∑PCB	1.5
∑DDT	8
HCB	1
HCH(∑α+β+γ)	1
PCDD/F	100

Notes:

- PAU are sum of: anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(g,h,i)perylene, fenanthrene, fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, nafthalene, pyrene
- PCB are sum of congeners (28, 52, 101, 118, 138, 153, 18)
- DDT sum of DDT, DDE, DDD, (o',p' - a p',p'- izomers)
- HCB, HCH, PCDD/F are monitored as suspected previous pollution, such as pollution from industry
- PCDD/F limit value(ng.kg-1, for dry soil)

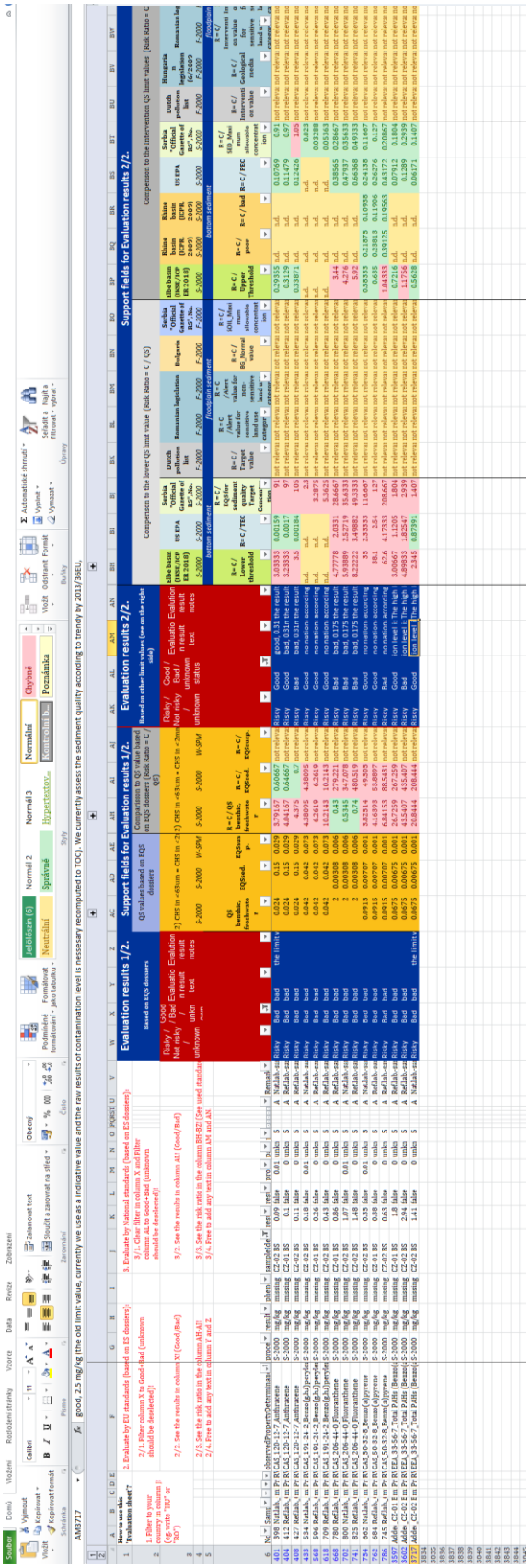

Fig. 3.5 Substances over the European standards in the baseline stations of Czech Republic

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

3.6. HUNGARY

HU-01 BABÓCSA, BABÓCSAI-RINYA RIVER

PAHs

Laboratory results from bottom sediment and suspended sediment

At this monitoring site, all the PAH concentrations measured in the river bottom sediment are below all the considered quality standards. The laboratory results are <LOQ or =LOQ. Based on bottom sediment results at Babócsa monitoring site, there is no hazard for any damages to the bethics or water related ecosystem at the time of sampling. However, based on PAH concentrations in suspended particular matter the Total PAHs (EEA_33-56-7_Total PAHs: Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(ghi)perylene, Indeno(1,2,3-cd)pyrene) concentration is 41.3 times higher than the EQSsusp; which is caused by $C_{Benzo(g,h,i)perylene}$= 0.018 mg/kg plus $C_{Indeno(1,2,3\text{-}cd)pyrene}$ = 0.032 mg/kg. In addition, the measured concentration of the fluoranthene (=0.033 mg/kg) is 5.4 times higher than the EQSsusp.

			Support fields for Evaluation results 1/2.						Support fields for Evaluation results 2/2.								
			QS values based on EQS			Comparisson to QS value based			Comperison to the lower QS limit			Comperison to the Intervention QS limit values (Risk Ratio =					
			2) CHS in <63um = CHS in <2mm			2) CHS in <63um = CHS in <2mm			Elbe basin (IKSE/ICPER 2018)	US EPA	Serbia "Official Gazette of RS", No. 50/2012	Elbe basin (IKSE/ICPER 2018)	Rhine basin (ICPR, 2009)	Rhine basin (ICPR, 2009)	US EPA	Serbia "Official Gazette of RS", No. 50/2012	
			S-2000	S-2000	W-SPM	S-2000	S-2000	W-SPM	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	
									bottom sediment			bottom sediment					
observedPropertyDeterminandCode	procedureAnalysedMatrix	Remarks	QS benthic, freshwater	EQSsed.	EQSsusp.	R = C / QS benthic, freshwater	R = C / EQSsed.	R = C / EQSsusp.	R= C / Lower threshold	R= C / TEC	R = C / EQS for sediment quality Target Concentratio	R= C / Upper Threshold	R= C / poor	R= C / bad	R= C / PEC	R = C / SED_Maximum allowable concentratio	
CAS_120-12-7_Anthracene	S-2000	Nat.lab.-	0.024	0.15	0.0294	0.208333	0.033333	not relevar	0.166667	8.74E-05	LOQ>limit valu	0.016129	n.d.	n.d.	0.005917	0.05	
CAS_120-12-7_Anthracene	S-2000	Ref.lab.-	0.024	0.15	0.0294	0.020833	0.003333	not relevar	0.016667	8.74E-06	LOQ>limit valu	0.001613	n.d.	n.d.	0.000592	0.005	
CAS_191-24-2_Benzo(g,h,i)perylene	S-2000	Nat.lab.-	0.042	0.042	0.0727	0.119048	0.119048	not relevar	n.d.	n.d.	0.0625	n.d.	n.d.	n.d.	n.d.	0.000625	
CAS_191-24-2_Benzo(g,h,i)perylene	S-2000	Ref.lab.-	0.042	0.042	0.0727	0.02381	0.02381	not relevar	n.d.	n.d.	0.0125	n.d.	n.d.	n.d.	n.d.	0.000125	
CAS_193-39-5_Indeno(1,2,3-cd)pyrene	S-2000	Ref.lab.-	0	0	0	n.d.	n.d.	not relevar	n.d.	n.d.	0.016666667	n.d.	n.d.	n.d.	n.d.	0.000166667	
CAS_193-39-5_Indeno(1,2,3-cd)pyrene	S-2000	Nat.lab.-	0	0	0	n.d.	n.d.	not relevar	n.d.	n.d.	0.083333333	n.d.	n.d.	n.d.	n.d.	0.000833333	
CAS_205-99-2_Benzo(b)fluoranthene	S-2000	Nat.lab.-	0.0707	0.00707	0.0013	0.070721	LOQ>limit	not relevar	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
CAS_206-44-0_Fluoranthene	S-2000	Ref.lab.-	2	0.00308	0.0061	0.0005	0.324675	not relevar	0.005556	0.002364	0.033333333	0.004	n.d.	n.d.	0.000448	0.000333333	
CAS_207-08-9_Benzo(k)fluoranthene	S-2000	Nat.lab.-	0.0675	0.00675	0.0012	0.074074	LOQ>limit	not relevar	n.d.	n.d.	0.25	n.d.	n.d.	n.d.	n.d.	0.0025	
CAS_50-32-8_Benzo(a)pyrene	S-2000	Nat.lab.-	0.0915	0.00707	0.0013	0.054645	LOQ>limit	not relevar	LOQ>limit	0.033333	LOQ>limit valu	0.008333	0.003125	0.001563	0.003448	0.001666667	
CAS_50-32-8_Benzo(a)pyrene	S-2000	Ref.lab.-	0.0915	0.00707	0.0013	0.010929	0.141443	not relevar	0.1	0.006667	0.333333333	0.001667	0.000625	0.000313	0.00069	0.000333333	
EEA_32-23-5_Total Benzo(b)fluor-anthene (CAS_205-99-2) + Benzo(k)fluor-anthene (CAS_207-08-9)	S-2000	Ref.lab.-	0.0675	0.00675	0.0012	0.014815	0.148148	not relevar	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(ghi)perylene, Indeno(1,2,3-cd)pyrene)	S-2000	Ref.lab.-	0.0675	0.00675	0.0012	0.059259	0.592593	not relevar	0.006667	0.002484	0.004	0.0016	n.d.	n.d.	0.000175	0.0004	
EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(ghi)perylene, Indeno(1,2,3-cd)pyrene)	S-2000	Nat.lab.-	0.0675	0.00675	0.0012	0.074074	LOQ>limit	not relevar	0.008333	0.003106	0.005	0.002	n.d.	n.d.	0.000219	0.0005	
CAS_120-12-7_Anthracene	W-SPM	Ref.lab.-	0.024	0.15	0.0294	not relevan	not relevan	0.170184	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_191-24-2_Benzo(g,h,i)perylene	W-SPM	Ref.lab.-	0.042	0.042	0.0727	not relevan	not relevan	0.247593	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_193-39-5_Indeno(1,2,3-cd)pyrene	W-SPM	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_206-44-0_Fluoranthene	W-SPM	Ref.lab.-	2	0.00308	0.0061	not relevan	not relevan	5.438634	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_50-32-8_Benzo(a)pyrene	W-SPM	Ref.lab.-	0.0915	0.00707	0.0013	not relevan	not relevan	0.397772	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
EEA_32-23-5_Total Benzo(b)fluor-anthene (CAS_205-99-2) + Benzo(k)fluor-anthene (CAS_207-08-9)	W-SPM	Ref.lab.-	0.0675	0.00675	0.0012	not relevan	not relevan	0.413223	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(ghi)perylene, Indeno(1,2,3-cd)pyrene)	W-SPM	Ref.lab.-	0.0675	0.00675	0.0012	not relevan	not relevan	41.32231	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	

Fig. 3.6.1. Evaluation of PAHs measured in the bottom sediment (S-2000) and suspended sediment (W-SPM) at the Babócsai-Rinya, Babócsa monitoring site. Red highlight indicates exceedance of EQS values.

These results of HS concentration measurements in the SPM are very good indicators for the current pollution activity, therefore, checking for active PAH sources in the monitored water body is highly recommended

Laboratory results from overbank sediment

The PAH concentrations measured in the overbank sediment, including both the top soil (0-5cm) and bottom soil (40-50cm), are all below all types of soil quality standards. Based on the overbank sediment samples at Babócsa monitoring site, there is no hazard posed by the overbank soils at the time of sampling. All of the results from bottom soil samples are under LOQ, too. But some of the reference lab top soil results are above the LOQ (or equal to the LOQ): Benzo(g,h,i)perylene=0.002 mg/kg;Indeno(1,2,3-cd)pyrene=0.002 mg/kg; Fluoranthene=0.002 mg/kg; Benzo(a)pyrene=0.001 mg/kg; Benzo(b)fluoranthene + Benzo(k)fluoranthene =0.002 mg/kg.

		3. Evaluate by Nationa	Support fields for Evaluation results 2/2.										
		3/1. Clear	Comperison to the lower QS limit value (Risk Ratio = C /					Comperison to the Intervention QS limit values (Risk Ratio = C / QS)					
		3/2. See the results in c	Dutch pollution list	Romanian legislation		Bulgaria	Serbia "Official Gazette of RS", No. 30/2018	Dutch pollution list	Hungarian legislation (6/2009 (IV. 14.))	Romanian legislation		Bulgaria	Serbia "Official Gazette of RS", No. 50/2012
		3/3. See the risk ratio i	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000
		3/4. Free to add any te	floodplain sediment					floodplain sediment					
observedPropertyDeterminandCode	procedureAnalysedMatrix	sampleIdentifier	Remarks	R= C / Target value	R = C /Alert value for sensitive land us	R = C /Alert value for non-sensitiv	R = C / BG_Normal value	R = C / SOIL_Maximum allowable concentr	R= C / Intervention value	R= C / Geological media	R = C/ Intervention value for sensitiv	R = C/ Intervention value for non-sensitiv	R = C/ BG_Intervention value	R = C/ SOIL_Concentration at which remediation of sediments is
CAS_120-12-7_Anthracene	F-2000	HU-01 FS BS	Ref.lab.-	n.d.	0.0001	0.00005	0.1	n.d.	n.d.	n.d.	0.00005	0.000005	0.001	n.d.
CAS_120-12-7_Anthracene	F-2000	HU-01 FS BS	Nat.lab.-	n.d.	0.001	0.0005	LOQ>limit	n.d.	n.d.	n.d.	0.0005	0.00005	0.01	n.d.
CAS_191-24-2_Benzo(g,h,i)perylene	F-2000	HU-01 FS BS	Ref.lab.-	n.d.	0.0001	0.00005	0.125	n.d.	n.d.	n.d.	0.00005	0.000005	0.005	n.d.
CAS_191-24-2_Benzo(g,h,i)perylene	F-2000	HU-01 FS BS	Nat.lab.-	n.d.	0.001	0.0005	LOQ>limit	n.d.	n.d.	n.d.	0.0005	0.00005	0.05	n.d.
CAS_193-39-5_Indeno(1,2,3-cd)pyrene	F-2000	HU-01 FS BS	Ref.lab.-	n.d.	n.d.	n.d.	0.045455	n.d.	n.d.	n.d.	n.d.	n.d.	0.0025	n.d.
CAS_193-39-5_Indeno(1,2,3-cd)pyrene	F-2000	HU-01 FS BS	Nat.lab.-	n.d.	n.d.	n.d.	0.454545	n.d.	n.d.	n.d.	n.d.	n.d.	0.025	n.d.
CAS_205-99-2_Benzo(b)fluoranthene	F-2000	HU-01 FS BS	Nat.lab.-	n.d.	0.0025	0.001	n.d.	n.d.	n.d.	n.d.	0.001	0.0001	n.d.	n.d.
CAS_206-44-0_Fluoranthene	F-2000	HU-01 FS BS	Ref.lab.-	n.d.	0.0001	0.00005	0.033333	n.d.	n.d.	n.d.	0.00005	0.000005	0.005	n.d.
CAS_207-08-9_Benzo(k)fluoranthene	F-2000	HU-01 FS BS	Nat.lab.-	n.d.	0.0025	0.001	n.d.	n.d.	n.d.	n.d.	0.001	0.0001	n.d.	n.d.
CAS_50-32-8_Benzo(a)pyrene	F-2000	HU-01 FS BS	Ref.lab.-	n.d.	0.00025	0.0001	0.1	n.d.	n.d.	n.d.	0.0001	0.00005	0.005	n.d.
CAS_50-32-8_Benzo(a)pyrene	F-2000	HU-01 FS BS	Nat.lab.-	n.d.	0.0025	0.001	LOQ>limit	n.d.	n.d.	n.d.	0.001	0.0005	0.05	n.d.
EEA_32-23-5_Total Benzo(b)fluor-anthene (C/	F-2000	HU-01 FS BS	Ref.lab.-	n.d.	0.00025	0.0001	n.d.	n.d.	n.d.	n.d.	0.0001	0.00001	n.d.	n.d.
EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Be	F-2000	HU-01 FS BS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	0.0005	1.25E-05	0.0005	n.d.	n.d.	n.d.	0.0000125
EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Be	F-2000	HU-01 FS BS	Nat.lab.-	n.d.	n.d.	n.d.	n.d.	0.005	0.000125	0.005	n.d.	n.d.	n.d.	0.000125
CAS_120-12-7_Anthracene	F-2000	HU-01 FS TS	Ref.lab.-	n.d.	0.0001	0.00005	0.1	n.d.	n.d.	n.d.	0.00005	0.000005	0.001	n.d.
CAS_120-12-7_Anthracene	F-2000	HU-01 FS TS	Nat.lab.-	n.d.	0.001	0.0005	LOQ>limit	n.d.	n.d.	n.d.	0.0005	0.00005	0.01	n.d.
CAS_191-24-2_Benzo(g,h,i)perylene	F-2000	HU-01 FS TS	Ref.lab.-	n.d.	0.0004	0.0002	0.5	n.d.	n.d.	n.d.	0.0002	0.00002	0.02	n.d.
CAS_191-24-2_Benzo(g,h,i)perylene	F-2000	HU-01 FS TS	Nat.lab.-	n.d.	0.001	0.0005	LOQ>limit	n.d.	n.d.	n.d.	0.0005	0.00005	0.05	n.d.
CAS_193-39-5_Indeno(1,2,3-cd)pyrene	F-2000	HU-01 FS TS	Ref.lab.-	n.d.	n.d.	n.d.	0.181818	n.d.	n.d.	n.d.	n.d.	n.d.	0.01	n.d.
CAS_193-39-5_Indeno(1,2,3-cd)pyrene	F-2000	HU-01 FS TS	Nat.lab.-	n.d.	n.d.	n.d.	0.454545	n.d.	n.d.	n.d.	n.d.	n.d.	0.025	n.d.
CAS_205-99-2_Benzo(b)fluoranthene	F-2000	HU-01 FS TS	Nat.lab.-	n.d.	0.0025	0.001	n.d.	n.d.	n.d.	n.d.	0.001	0.0001	n.d.	n.d.
CAS_206-44-0_Fluoranthene	F-2000	HU-01 FS TS	Ref.lab.-	n.d.	0.0004	0.0002	0.133333	n.d.	n.d.	n.d.	0.0002	0.00002	0.02	n.d.
CAS_207-08-9_Benzo(k)fluoranthene	F-2000	HU-01 FS TS	Nat.lab.-	n.d.	0.0025	0.001	n.d.	n.d.	n.d.	n.d.	0.001	0.0001	n.d.	n.d.
CAS_50-32-8_Benzo(a)pyrene	F-2000	HU-01 FS TS	Ref.lab.-	n.d.	0.0005	0.0002	0.2	n.d.	n.d.	n.d.	0.0002	0.0001	0.01	n.d.
CAS_50-32-8_Benzo(a)pyrene	F-2000	HU-01 FS TS	Nat.lab.-	n.d.	0.0025	0.001	LOQ>limit	n.d.	n.d.	n.d.	0.001	0.0005	0.05	n.d.
EEA_32-23-5_Total Benzo(b)fluor-anthene (C/	F-2000	HU-01 FS TS	Ref.lab.-	n.d.	0.001	0.0004	n.d.	n.d.	n.d.	n.d.	0.0004	0.00004	n.d.	n.d.
EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Be	F-2000	HU-01 FS TS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	0.007	0.000175	0.007	n.d.	n.d.	n.d.	0.000175
EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Be	F-2000	HU-01 FS TS	Nat.lab.-	n.d.	n.d.	n.d.	n.d.	0.005	0.000125	0.005	n.d.	n.d.	n.d.	0.000125

Fig. 3.6.2. Evaluation of PAHs measured in the overbank (floodplain) sediment (F-2000) at the Babócsai-Rinya, Babócsa monitoring site. Note that all HS values are below the EQS values.

Conclusions for PAHs

The concentrations above the LOQ measured in the top soil overbank sediment, and the values above the EQS values in water suspended particular matter indicate some active pollution sources in the monitored water body and thus hazard from PAHs. The national monitoring system has also selected this site for regular biota monitoring to detect PAH problems, but here we also suggest regular SPM monitoring. Every measurement in biota (fish) was under <LOQ and also <EQS biota in 2013-2019 monitoring cycle. However, the monitoring frequency should be higher.

Heating (burning wood, pallet or gas) of households alone cannot be responsible for the observed elevated PAH concentrations because the sampling time was at the end of May, after the winter heating period. The PAHs can remobilize from bottom sediment to suspended sediment, but in this case, it is not likely because the bottom sediment concentrations are usually under LOQ.

Concentration of dicofol, hexachlorobenzene, heptachlor and heptachlor epoxide were also below LOQ, but the EQS are very low, therefore the hazard cannot be evaluated. Based on US EPA PEC value, the Elbe, the Rhine basin and the Serbian thresholds the benthics and water related ecosystem are not at risk.

				Support fields for Evaluation results 1/2.						Support fields for Evaluation results 2/2.							
		3. Evaluate by National		QS values based on EQS			Comparisson to QS value based			Comperison to the lower QS limit			Comperison to the Intervention QS limit values (Risk Ratio =				
		3/1. Clear		2) CHS in <63um = CHS in <2mm			2) CHS in <63um = CHS in <2mm			Elbe basin (IKSE/ICPER 2018)	US EPA	Serbia "Official Gazette of RS", No. 50/2012	Elbe basin (IKSE/ICPER 2018)	Rhine basin (ICPR, 2009)	Rhine basin (ICPR, 2009)	US EPA	Serbia "Official Gazette of RS", No. 50/2012
		3/2. See the results in c		S-2000	S-2000	W-SPM	S-2000	S-2000	W-SPM	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000
		3/3. See the risk ratio i								bottom sediment						bottom sediment	
		3/4. Free to add any text in column AM and AN.															
observedPropertyDeterminandCode	procedureAnalysedMatrix	sampleIdentifier	Remarks	QS benthic, freshwater	EQSsed.	EQSsusp.	R = C / QS benthic, freshwater	R = C / EQSsed.	R = C / EQSsusp.	R= C / Lower threshold	R= C / TEC	R = C / EQS for sediment quality Target Concentratio	R= C / Upper Threshold	R= C / poor	R= C / bad	R= C / PEC	R = C / SED_Maximum allowable concentratio
CAS_115-32-2_Dicofol	S-2000	HU-01 BS	Ref.lab.-	0.00033	0.00033	7E-05	LOQ>limit	LOQ>limit	not relevan	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CAS_76-44-8_Heptachlor	S-2000	HU-01 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevan	n.d.	n.d.	0.003571429	n.d.	n.d.	n.d.	n.d.	3.67647E-05
CAS_1024-57-3_Heptachlor epoxide	S-2000	HU-01 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevan	n.d.	LOQ>limit	LOQ>limit valu	n.d.	n.d.	n.d.	0.15625	LOQ>limit value
CAS_608-73-1_Hexachlorocyclohexane	S-2000	HU-01 BS	Ref.lab.-	0.0103	0.0103	0.0108	0.242718	0.242718	not relevan	LOQ>limit	LOQ>limit	0.00025	LOQ>limit	n.d.	n.d.	LOQ>limit	n.d.
CAS_118-74-1_Hexachlorobenzene	S-2000	HU-01 BS	Ref.lab.-	0	0.000299	0.0025	n.d.	LOQ>limit	not relevan	LOQ>limit	n.d.	n.d.	0.147059	0.015625	0.007813	n.d.	n.d.
CAS_124495-18-7_Quinoxyfen	S-2000	HU-01 BS	Ref.lab.-	0.0055	0.0055	0.0274	0.454545	0.454545	not relevan	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
EEA_33-50-1_Heptachlor and heptachlor epox	S-2000	HU-01 BS	Ref.lab.-	0.000015	1.05E-07	3E-06	LOQ>limit	LOQ>limit	not relevan	n.d.	LOQ>limit	n.d.	n.d.	n.d.	n.d.	0.15625	n.d.
CAS_608-73-1_Hexachlorocyclohexane	S-2000	HU-01 BS	Ref.lab.-	0.0103	0.0103	0.0108	0.242718	0.242718	not relevan	LOQ>limit	LOQ>limit	0.00025	LOQ>limit	n.d.	n.d.	LOQ>limit	n.d.
CAS_115-32-2_Dicofol	W-SPM	HU-01-SS	Ref.lab.-	0.00033	0.00033	7E-05	not relevan	not relevan	LOQ>limit	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant
CAS_76-44-8_Heptachlor	W-SPM	HU-01-SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant
CAS_1024-57-3_Heptachlor epoxide	W-SPM	HU-01-SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant
CAS_608-73-1_Hexachlorocyclohexane	W-SPM	HU-01-SS	Ref.lab.-	0.0103	0.0103	0.0108	not relevan	not relevan	0.231481	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant
CAS_118-74-1_Hexachlorobenzene	W-SPM	HU-01-SS	Ref.lab.-	0	0.000299	0.0025	not relevan	not relevan	LOQ>limit	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant
CAS_124495-18-7_Quinoxyfen	W-SPM	HU-01-SS	Ref.lab.-	0.0055	0.0055	0.0274	not relevan	not relevan	0.091241	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant
EEA_33-50-1_Heptachlor and heptachlor epox	W-SPM	HU-01-SS	Ref.lab.-	0.000015	1.05E-07	3E-06	not relevan	not relevan	LOQ>limit	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant
CAS_608-73-1_Hexachlorocyclohexane	W-SPM	HU-01-SS	Ref.lab.-	0.0103	0.0103	0.0108	not relevan	not relevan	0.231481	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant

Fig. 3.6.3.Evaluation of Pesticides measured in the bottom sediment (S-2000) and suspended sediment (W-SPM) at the Babócsai-Rinya, Babócsa monitoring site. Note that Pesticides are below the EQS values.

Laboratory results from overbank sediment

Most of the Danube Countries have no quality standards for WFD pesticides. All laboratory results were under LOQ values, so there is no reason to protect water quality via overbank sediment for pesticides.

		3. Evaluate by National	Support fields for Evaluation results 2/2.											
		3/1. Clear	Comperison to the lower QS limit value (Risk Ratio = C / QS)					Comperison to the Intervention QS limit values (Risk Ratio = C / QS)						
		3/2. See the results in c	Dutch pollution list	Romanian legislation		Bulgaria	Serbia "Official Gazette of RS", No. 30/2018 and 64/2019	Dutch pollution list	Hungarian legislation (6/2009 (IV. 14.))	Romanian legislation		Bulgaria	Serbia "Official Gazette of RS", No. 50/2012	
		3/3. See the risk ratio i	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	
		3/4. Free to add any ts	floodplain sediment					floodplain sediment						
observedPropertyDeterminandCode	procedureAnalysedMatrix	sampleIdentifier	Remarks	R= C / Target value	R = C /Alert value for sensitive land use categori	R = C /Alert value for non-sensitive land use categori	R = C / BG_Normal value	R = C / SOIL_Maximum allowable concentratio	R= C / Intervention value	R= C / Geological media	R = C/ Intervention value for sensitive land use	R = C/ Intervention value for non-sensitiv	R = C/ BG_Intervention value	R = C/ SOIL_Concentration at which remediation of sediments is requir
CAS_115-32-2_Dicofol	F-2000	HU-01 FS BS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CAS_115-32-2_Dicofol	F-2000	HU-01 FS TS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CAS_76-44-8_Heptachlor	F-2000	HU-01 FS BS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	LOQ>limit value	0.000625	n.d.	n.d.	n.d.	n.d.	0.000625
CAS_76-44-8_Heptachlor	F-2000	HU-01 FS TS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	LOQ>limit value	0.000625	n.d.	n.d.	n.d.	n.d.	0.000625
CAS_1024-57-3_Heptachlor epoxide	F-2000	HU-01 FS BS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	LOQ>limit value	0.000625	n.d.	n.d.	n.d.	n.d.	0.000625
CAS_1024-57-3_Heptachlor epoxide	F-2000	HU-01 FS TS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	LOQ>limit value	0.000625	n.d.	n.d.	n.d.	n.d.	0.000625
CAS_608-73-1_Hexachlorocyclohexane	F-2000	HU-01 FS BS	Ref.lab.-	n.d.	0.01	0.005	n.d.	0.25	n.d.	0.025	0.0033333	0.00125	0.25	0.00125
CAS_608-73-1_Hexachlorocyclohexane	F-2000	HU-01 FS TS	Ref.lab.-	n.d.	0.01	0.005	n.d.	0.25	n.d.	0.025	0.0033333	0.00125	0.25	0.00125
CAS_118-74-1_Hexachlorobenzene	F-2000	HU-01 FS BS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	n.d.	0.00125	n.d.	n.d.	n.d.	0.01	n.d.
CAS_118-74-1_Hexachlorobenzene	F-2000	HU-01 FS TS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	n.d.	0.00125	n.d.	n.d.	n.d.	0.01	n.d.
CAS_124495-18-7_Quinoxyfen	F-2000	HU-01 FS BS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CAS_124495-18-7_Quinoxyfen	F-2000	HU-01 FS TS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
EEA_33-50-1_Heptachlor and heptachlor epox	F-2000	HU-01 FS BS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	n.d.	0.000625	n.d.	n.d.	n.d.	n.d.	n.d.
EEA_33-50-1_Heptachlor and heptachlor epox	F-2000	HU-01 FS TS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	n.d.	0.000625	n.d.	n.d.	n.d.	n.d.	n.d.
CAS_608-73-1_Hexachlorocyclohexane	F-2000	HU-01 FS BS	Ref.lab.-	n.d.	0.01	0.005	n.d.	0.25	n.d.	0.025	0.0033333	0.00125	0.25	0.00125
CAS_608-73-1_Hexachlorocyclohexane	F-2000	HU-01 FS TS	Ref.lab.-	n.d.	0.01	0.005	n.d.	0.25	n.d.	0.025	0.0033333	0.00125	0.25	0.00125

Fig. 3.6.4. Evaluation of Pesticides measured in the overbank (floodplain) sediment (F-2000) at the Babócsai-Rinya, Babócsa monitoring site. Note that all the Pesticide concentrations are below the LOQ values.

Conclusions for pesticides

Based on sediment results, there is no need for detailed monitoring for the selected pesticides form sediment at this site, the biota and passive membrane sampling methods should be sufficient.

Metals

Laboratory results from bottom sediment and suspended sediment

EQSsed and EQSsusp were delivered for Lead and Nickel based on EQS dossiers data. For these compounds, based on bottom sediment results at Babócsai-Rinya, Babócsa monitoring site, there is no hazard for any damages for the benthics or water related ecosystems from these metals at the time of sampling.

Mercury, arsenic and cadmium results indicates some risk (warning level) based on Elbe Basin lower threshold and US EPA TEC value, but based on upper thresholds and other national standards.

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				Support fields for Evaluation results 1/2.						Support fields for Evaluation results 2/2.								
		3. Evaluate by Nationa		QS values based on EQS			Comparisson to QS value based			Comperison to the lower QS limit			Comperison to the Intervention QS limit values (Risk Ratio =					
		3/1. Clear		2) CHS in <63um = CHS in <2mm			2) CHS in <63um = CHS in <2mm			Elbe basin (IKSE/ICPER 2018)	US EPA	Serbia "Official Gazette of RS", No. 50/2012	Elbe basin (IKSE/ICPER 2018)	Rhine basin (ICPR, 2009)	Rhine basin (ICPR, 2009)	US EPA	Serbia "Official Gazette of RS", No. 50/2012	
		3/2. See the results in		S-2000	S-2000	W-SPM	S-2000	S-2000	W-SPM	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	
		3/3. See the risk ratio i								bottom sediment			bottom sediment					
		3/4. Free to add any text in column AM and AN.																
bservedPropertyDeterminandCode	procedureAnalysedMatrix	sampleIdentifier	Remarks	QS benthic, freshwater	EQSsed.	EQSsusp.	R = C / QS benthic, freshwater	R = C / EQSsed.	R = C / EQSsusp.	R= C / Lower threshold	R= C / TEC	R = C / EQS for sediment quality Target Concentratic	R= C / Upper Threshold	R= C / poor	R= C / bad	R= C / PEC	R = C / SED_Maximum allowable concentratio	
CAS_7439-92-1_Lead and its compounds	S-2000	HU-01 BS	Ref.lab.-	41	131	23	0.030976	0.009695	not relevar	0.0508	0.035475	0.014941176	0.023962	0.003175	0.001588	0.009922	0.004096774	
CAS_7439-92-1_Lead and its compounds	S-2000	HU-01 BS	Nat.lab.-	41	131	23	0.141463	0.044275	not relevar	0.232	0.162011	0.068235294	0.109434	0.0145	0.00725	0.045313	0.018709677	
CAS_7439-97-6_Mercury and its compounds	S-2000	HU-01 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevar	1.2	1	0.6	0.382979	0.09	0.045	0.169811	0.1125	
CAS_7439-97-6_Mercury and its compounds	S-2000	HU-01 BS	Nat.lab.-	0	0	0	n.d.	n.d.	not relevar	0.333333	0.277778	0.166666667	0.106383	0.025	0.0125	0.04717	0.03125	
CAS_7440-02-0_Nickel and its compounds	S-2000	HU-01 BS	Ref.lab.-	56.632	56.632	75.445	0.027017	0.027017	not relevar	0.51	0.067401	0.043714286	0.028868	0.00765	0.003825	0.031481	0.034772727	
CAS_7440-02-0_Nickel and its compounds	S-2000	HU-01 BS	Nat.lab.-	56.632	56.632	75.445	0.043968	0.043968	not relevar	0.83	0.109692	0.071142857	0.046981	0.01245	0.006225	0.051235	0.056590909	
CAS_7440-38-2_Arsenic and its compounds	S-2000	HU-01 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevar	2.21519	1.787538	0.603448276	0.4375	n.d.	n.d.	0.530303	0.416666667	
CAS_7440-43-9_Cadmium and its compounds	S-2000	HU-01 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevar	0.136364	0.030303	0.0375	0.013043	0.0075	0.00375	0.006024	0.0046875	
CAS_7440-43-9_Cadmium and its compounds	S-2000	HU-01 BS	Nat.lab.-	0	0	0	n.d.	n.d.	not relevar	2.5	0.555556	0.6875	0.23913	0.1375	0.06875	0.110442	0.0859375	
CAS_7440-47-3_Chromium and its compounds	S-2000	HU-01 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevar	0.6	0.359447	0.156	0.024375	n.d.	n.d.	0.140541	0.065	
CAS_7440-47-3_Chromium and its compounds	S-2000	HU-01 BS	Nat.lab.-	0	0	0	n.d.	n.d.	not relevar	0.091923	0.055069	0.0239	0.003734	n.d.	n.d.	0.021532	0.009958333	
CAS_7440-50-8_Copper and its compounds	S-2000	HU-01 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevar	0.138571	0.061392	0.053888889	0.012125	0.0097	0.00485	0.01302	0.017636364	
CAS_7440-50-8_Copper and its compounds	S-2000	HU-01 BS	Nat.lab.-	0	0	0	n.d.	n.d.	not relevar	0.035714	0.015823	0.013888889	0.003125	0.0025	0.00125	0.003356	0.004545455	
CAS_7440-66-6_Zinc and its compounds	S-2000	HU-01 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevar	0.0432	0.071405	0.061714286	0.0108	0.0108	0.0054	0.018824	0.020093023	
CAS_7440-66-6_Zinc and its compounds	S-2000	HU-01 BS	Nat.lab.-	0	0	0	n.d.	n.d.	not relevar	0.02315	0.038264	0.033071429	0.005788	0.005788	0.002894	0.010087	0.010767442	
CAS_7439-92-1_Lead and its compounds	W-SPM	HU-01-SS	Ref.lab.-	41	131	23	not relevan	not relevan	0.621739	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_7439-97-6_Mercury and its compounds	W-SPM	HU-01-SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_7440-02-0_Nickel and its compounds	W-SPM	HU-01-SS	Ref.lab.-	56.632	56.632	75.445	not relevan	not relevan	0.246537	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_7440-38-2_Arsenic and its compounds	W-SPM	HU-01-SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_7440-43-9_Cadmium and its compounds	W-SPM	HU-01-SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_7440-47-3_Chromium and its compounds	W-SPM	HU-01-SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_7440-50-8_Copper and its compounds	W-SPM	HU-01-SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_7440-66-6_Zinc and its compounds	W-SPM	HU-01-SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	

Fig. 3.6.5. Evaluation of Metals measured in the bottom sediment (S-2000) and suspended sediment (W-SPM) at the Babócsai-Rinya, Babócsa monitoring site. Red highlight indicates exceedance of EQS values.

Laboratory results from overbank sediment

The metals from bottom soil overbank sediment are below all the considered intervention soil quality standards. Based on Bulgarian 'normal value' standards (natural background), mercury is 5 times higher and cadmium is 2 times higher than these limit values. The picture of the top soil overbank sediment results is worst. Concentrations of arsenic and cadmium measured in the top soil samples are 1.5 times higher than the Hungarian national soil intervention standard.

Conclusions for metals

Based on bottom, suspended and overbank sediment samples, there is no hazard for the benthics or water related ecosystems from these metals at the time of sampling. The regular monitoring of metals, mainly for arsenic, mercury and cadmium is important, and trend evaluation is also suggested. The most suitable sediment matrix can be the bottom sediment, but site-specific EQS values for metals at Babócsai-Rinya, Babócsa monitoring site are needed for proper risk assessment.

Based on the Hungarian regular water monitoring data, the Babócsa monitoring site is in risky status (and also in bad status until more site-specific data will be collected) caused by high cadmium concentration at the Nagyatád and Babócsa monitoring stations. The monitoring frequency of cadmium seems to be too low. For cadmium the development of local EQS is needed for proper risk assessment and more reliable status assessment.

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

Arsenic is a well monitored parameter in the Babócsai-Rinya water body, the status is good based on water quality results, but the average value is 81% of AA-EQS, and maximum value is 94% of MAC-EQS, so this problem should receive attention.

For Mercury, the assessment by biota monitoring could also be useful.

In the catchment of Babócsai-Rinya River, there is no obvious industrial source for metals, thus all the relevant emission sources should be subdued to investigative monitored time-to-time, such as municipal and industrial wastewater treatment plans in the catchment. It is noted that the main source of cadmium is fertilizers used in the EU, and not industrial activities.

				Support fields for Evaluation results 2/2.										
				Comperison to the lower QS limit value (Risk Ratio = C / QS)					Comperison to the Intervention QS limit values (Risk Ratio = C / QS)					
				Dutch pollution list	Romanian legislation		Bulgaria	Serbia "Official Gazette of RS", No. 30/2018 and 64/2019	Dutch pollution list	Hungarian legislation (6/2009 (IV. 14.))	Romanian legislation		Bulgaria	Serbia "Official Gazette of RS", No. 50/2012
				F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000
				floodplain sediment					floodplain sediment					
observedPropertyDeterminandCode	procedureAnalysedMatrix	sampleIdentifier	Remarks	R= C / Target value	R = C /Alert value for sensitive land use categori	R = C /Alert value for non-sensitive land use categori	R = C / BG_Normal value	R = C / SOIL_Maximum allowable concentration	R= C / Intervention value	R= C / Geological media	R = C/ Intervention value for sensitive land use	R = C/ Intervention value for non-sensitiv	R = C/ BG_Intervention value	R = C/ SOIL_Concentration at which remediation of sediments is requir
CAS_7440-38-2_Arsenic and its compounds	F-2000	HU-01 FS BS	Ref.lab.-	0.253103	0.489333333	0.2936	0.734	0.253103448	0.133455	0.489333	0.2936	0.1468	0.081556	0.133454545
CAS_7440-43-9_Cadmium and its compounds	F-2000	HU-01 FS BS	Ref.lab.-	0.05	0.013333333	0.008	0.1	0.05	0.003333	0.04	0.008	0.004	0.003333	0.003333333
CAS_7440-47-3_Chromium and its compounds	F-2000	HU-01 FS BS	Ref.lab.-	0.114	0.114	0.038	0.175385	0.114	0.03	0.152	0.038	0.019	0.020727	0.03
CAS_7440-50-8_Copper and its compounds	F-2000	HU-01 FS BS	Ref.lab.-	0.071111	0.0256	0.01024	0.075294	0.071111111	0.013474	0.034133	0.0128	0.00512	0.00512	0.013473684
CAS_7439-97-6_Mercury and its compounds	F-2000	HU-01 FS BS	Ref.lab.-	0.5	0.15	0.0375	5	0.5	0.015	0.3	0.075	0.015	0.015	0.015
CAS_7440-02-0_Nickel and its compounds	F-2000	HU-01 FS BS	Ref.lab.-	0.106286	0.0496	0.0186	0.08087	0.106285714	0.017714	0.093	0.0248	0.00744	0.0124	0.017714286
CAS_7439-92-1_Lead and its compounds	F-2000	HU-01 FS BS	Ref.lab.-	0.031765	0.054	0.0108	0.103846	0.031764706	0.005094	0.027	0.027	0.0027	0.0054	0.00509434
CAS_7440-66-6_Zinc and its compounds	F-2000	HU-01 FS BS	Ref.lab.-	0.097857	0.045666667	0.019571429	0.155682	0.097857143	0.019028	0.0685	0.0228333	0.0091333	0.015222	0.019027778
CAS_7440-43-9_Cadmium and its compounds	F-2000	HU-01 FS BS	Nat.lab.-	0.975	0.26	0.156	1.95	0.975	0.065	0.78	0.156	0.078	0.065	0.065
CAS_7440-47-3_Chromium and its compounds	F-2000	HU-01 FS BS	Nat.lab.-	0.0753	0.0753	0.0251	0.115846	0.0753	0.019816	0.1004	0.0251	0.01255	0.013691	0.019815789
CAS_7440-50-8_Copper and its compounds	F-2000	HU-01 FS BS	Nat.lab.-	0.013889	0.005	0.002	0.014706	0.013888889	0.002632	0.006667	0.0025	0.001	0.001	0.002631579
CAS_7439-97-6_Mercury and its compounds	F-2000	HU-01 FS BS	Nat.lab.-	0.166667	0.05	0.0125	LOQ>limit	0.166666667	0.005	0.1	0.025	0.005	0.005	0.005
CAS_7440-02-0_Nickel and its compounds	F-2000	HU-01 FS BS	Nat.lab.-	0.136571	0.063733333	0.0239	0.103913	0.136571429	0.022762	0.1195	0.0318667	0.00956	0.015933	0.022761905
CAS_7439-92-1_Lead and its compounds	F-2000	HU-01 FS BS	Nat.lab.-	0.026	0.0442	0.00884	0.085	0.026	0.00417	0.0221	0.0221	0.00221	0.00442	0.004169811
CAS_7440-66-6_Zinc and its compounds	F-2000	HU-01 FS BS	Nat.lab.-	0.053929	0.025166667	0.010785714	0.085795	0.053928571	0.010486	0.03775	0.0125833	0.0050333	0.008389	0.010486111
CAS_7440-38-2_Arsenic and its compounds	F-2000	HU-01 FS TS	Ref.lab.-	0.803448	1.553333333	0.932	2.33	0.803448276	0.423636	1.553333	0.932	0.466	0.258889	0.423636364
CAS_7440-43-9_Cadmium and its compounds	F-2000	HU-01 FS TS	Ref.lab.-	0.1	0.026666667	0.016	0.2	0.1	0.006667	0.08	0.016	0.008	0.006667	0.006666667
CAS_7440-47-3_Chromium and its compounds	F-2000	HU-01 FS TS	Ref.lab.-	0.138	0.138	0.046	0.212308	0.138	0.036316	0.184	0.046	0.023	0.025091	0.036315789
CAS_7440-50-8_Copper and its compounds	F-2000	HU-01 FS TS	Ref.lab.-	0.137222	0.0494	0.01976	0.145294	0.137222222	0.026	0.065867	0.0247	0.00988	0.00988	0.026
CAS_7439-97-6_Mercury and its compounds	F-2000	HU-01 FS TS	Ref.lab.-	0.6	0.18	0.045	6	0.6	0.018	0.36	0.09	0.018	0.018	0.018
CAS_7440-02-0_Nickel and its compounds	F-2000	HU-01 FS TS	Ref.lab.-	0.149143	0.0696	0.0261	0.113478	0.149142857	0.024857	0.1305	0.0348	0.01044	0.0174	0.024857143
CAS_7439-92-1_Lead and its compounds	F-2000	HU-01 FS TS	Ref.lab.-	0.055176	0.0938	0.01876	0.180385	0.055176471	0.008849	0.0469	0.0469	0.00469	0.00938	0.008849057
CAS_7440-66-6_Zinc and its compounds	F-2000	HU-01 FS TS	Ref.lab.-	0.191429	0.089333333	0.038285714	0.304545	0.191428571	0.037222	0.134	0.0446667	0.0178667	0.029778	0.037222222
CAS_7440-43-9_Cadmium and its compounds	F-2000	HU-01 FS TS	Nat.lab.-	1.925	0.513333333	0.308	3.85	1.925	0.128333	1.54	0.308	0.154	0.128333	0.128333333
CAS_7440-47-3_Chromium and its compounds	F-2000	HU-01 FS TS	Nat.lab.-	0.137	0.137	0.045666667	0.210769	0.137	0.036053	0.182667	0.0456667	0.0228333	0.024909	0.036052632
CAS_7440-50-8_Copper and its compounds	F-2000	HU-01 FS TS	Nat.lab.-	0.067778	0.0244	0.00976	0.071765	0.067777778	0.012842	0.032533	0.0122	0.00488	0.00488	0.012842105
CAS_7439-97-6_Mercury and its compounds	F-2000	HU-01 FS TS	Nat.lab.-	0.166667	0.05	0.0125	LOQ>limit	0.166666667	0.005	0.1	0.025	0.005	0.005	0.005
CAS_7440-02-0_Nickel and its compounds	F-2000	HU-01 FS TS	Nat.lab.-	0.188857	0.088133333	0.03305	0.143696	0.188857143	0.031476	0.16525	0.0440667	0.01322	0.022033	0.03147619
CAS_7439-92-1_Lead and its compounds	F-2000	HU-01 FS TS	Nat.lab.-	0.053176	0.0904	0.01808	0.173846	0.053176471	0.008528	0.0452	0.0452	0.00452	0.00904	0.008528302
CAS_7440-66-6_Zinc and its compounds	F-2000	HU-01 FS TS	Nat.lab.-	0.160714	0.075	0.032142857	0.255682	0.160714286	0.03125	0.1125	0.0375	0.015	0.025	0.03125

Fig. 3.6.6.Evaluation of Metals measured in the overbank sediment (F-2000) at the Babócsai-Rinya, Babócsa monitoring site. Red highlight indicates exceedance of EQS values.

HU-02 POCSAJ, BERETTYÓ RIVER

PAHs

Laboratory results from bottom sediment and suspended sediment

All the PAH concentrations measured in the bottom sediment are below all the quality standards, except the sum of total PAHs, which is 1.9 times higher than the EQSsed. Based on bottom sediment results at the Pocsaj monitoring station, there is no hazard for the benthics at the time of sampling, but there is a hazard for the water related ecosystems (including pelagic communities, biota and human health). Based on PAH concentrations in suspended sediments (SPM), the total PAHs (EEA_33-56-7_Total PAHs: Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(ghi)perylene, Indeno(1,2,3-cd)pyrene) concentration is 13.2 times higher than the EQSsusp due to the high $C_{Benzo(g,h,i)perylene}$= 0.007 mg/kg plus $C_{Indeno(1,2,3-cd)pyrene}$ = 0.009 mg/kg concentration. Also, the concentration of the fluoranthene (=0.009 mg/kg) is 1.5 times higher than the EQSsusp. SPM seems to be a good indicator for the current pollution activity, therefore, checking the PAH sources in this water body is strongly recommended.

				Support fields for Evaluation results 1/2.						Support fields for Evaluation results 2/2.								
		3. Evaluate by National		QS values based on EQS			Comparisson to QS value based			Comperison to the lower QS limit			Comperison to the Intervention QS limit values (Risk Ratio =					
		3/1. Clear		2) CHS in <63um = CHS in <2mm			2) CHS in <63um = CHS in <2mm			Elbe basin (IKSE/ICPER 2018)	US EPA	Serbia "Official Gazette of RS", No. 50/2012	Elbe basin (IKSE/ICPER 2018)	Rhine basin (ICPR, 2009)	Rhine basin (ICPR, 2009)	US EPA	Serbia "Official Gazette of RS", No. 50/2012	
		3/2. See the results in c		S-2000	S-2000	W-SPM	S-2000	S-2000	W-SPM	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	
		3/3. See the risk ratio i								bottom sediment			bottom sediment					
		3/4. Free to add any text in column AM and AN.																
observedPropertyDeterminandCode	procedureAnalysedMatrix	sampleIdentifier	Remarks	QS benthic, freshwater	EQSsed.	EQSsusp.	R = C / QS benthic, freshwater	R = C / EQSsed.	R = C / EQSsusp.	R= C / Lower threshold	R= C / TEC	R = C / EQS for sediment quality Target Concentratio	R= C / Upper Threshold	R= C / poor	R= C / bad	R= C / PEC	R = C / SED_Maximum allowable concentratio	
CAS_120-12-7_Anthracene	S-2000	HU-02 BS	Ref.lab.-	0.024	0.15	0.0294	0.020833	0.003333	not relevar	0.016667	8.74E-06	LOQ>limit valu	0.001613	n.d.	n.d.	0.000592	0.005	
CAS_120-12-7_Anthracene	S-2000	HU-02 BS	Nat.lab.-	0.024	0.15	0.0294	0.208333	0.033333	not relevar	0.166667	8.74E-05	LOQ>limit valu	0.016129	n.d.	n.d.	0.005917	0.05	
CAS_191-24-2_Benzo(g,h,i)perylene	S-2000	HU-02 BS	Ref.lab.-	0.042	0.042	0.0727	0.095238	0.095238	not relevar	n.d.	n.d.	0.05	n.d.	n.d.	n.d.	n.d.	0.0005	
CAS_191-24-2_Benzo(g,h,i)perylene	S-2000	HU-02 BS	Nat.lab.-	0.042	0.042	0.0727	0.119048	0.119048	not relevar	n.d.	n.d.	0.0625	n.d.	n.d.	n.d.	n.d.	0.000625	
CAS_193-39-5_Indeno(1,2,3-cd)pyrene	S-2000	HU-02 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevar	n.d.	n.d.	0.05	n.d.	n.d.	n.d.	n.d.	0.0005	
CAS_193-39-5_Indeno(1,2,3-cd)pyrene	S-2000	HU-02 BS	Nat.lab.-	0	0	0	n.d.	n.d.	not relevar	n.d.	n.d.	0.083333333	n.d.	n.d.	n.d.	n.d.	0.000833333	
CAS_205-99-2_Benzo(b)fluoranthene	S-2000	HU-02 BS	Nat.lab.-	0.0707	0.00707	0.0013	0.070721	LOQ>limit	not relevar	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
CAS_206-44-0_Fluoranthene	S-2000	HU-02 BS	Ref.lab.-	2	0.00308	0.0061	0.0015	0.974026	not relevar	0.016667	0.007092	0.1	0.012	n.d.	n.d.	0.001345	0.001	
CAS_207-08-9_Benzo(k)fluoranthene	S-2000	HU-02 BS	Nat.lab.-	0.0675	0.00675	0.0012	0.074074	LOQ>limit	not relevar	n.d.	n.d.	0.25	n.d.	n.d.	n.d.	n.d.	0.0025	
CAS_50-32-8_Benzo(a)pyrene	S-2000	HU-02 BS	Ref.lab.-	0.0915	0.00707	0.0013	0.010929	0.141443	not relevar	0.1	0.006667	0.333333333	0.001667	0.000625	0.000313	0.00069	0.000333333	
CAS_50-32-8_Benzo(a)pyrene	S-2000	HU-02 BS	Nat.lab.-	0.0915	0.00707	0.0013	0.054645	LOQ>limit	not relevar	LOQ>limit	0.033333	LOQ>limit valu	0.008333	0.003125	0.001563	0.003448	0.001666667	
EEA_32-23-5_Total Benzo(b)fluor-anthene (C	S-2000	HU-02 BS	Ref.lab.-	0.0675	0.00675	0.0012	0.074074	0.740741	not relevar	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Be	S-2000	HU-02 BS	Ref.lab.-	0.0675	0.00675	0.0012	0.192593	1.925926	not relevar	0.021667	0.008075	0.013	0.0052	n.d.	n.d.	0.00057	0.0013	
EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Be	S-2000	HU-02 BS	Nat.lab.-	0.0675	0.00675	0.0012	0.074074	LOQ>limit	not relevar	0.008333	0.003106	0.005	0.002	n.d.	n.d.	0.000219	0.0005	
CAS_120-12-7_Anthracene	W-SPM	HU-02_SS	Ref.lab.-	0.024	0.15	0.0294	not relevan	not relevan	0.034037	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_191-24-2_Benzo(g,h,i)perylene	W-SPM	HU-02_SS	Ref.lab.-	0.042	0.042	0.0727	not relevan	not relevan	0.096286	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_193-39-5_Indeno(1,2,3-cd)pyrene	W-SPM	HU-02_SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_206-44-0_Fluoranthene	W-SPM	HU-02_SS	Ref.lab.-	2	0.00308	0.0061	not relevan	not relevan	1.483264	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_50-32-8_Benzo(a)pyrene	W-SPM	HU-02_SS	Ref.lab.-	0.0915	0.00707	0.0013	not relevan	not relevan	0.397772	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
EEA_32-23-5_Total Benzo(b)fluor-anthene (C	W-SPM	HU-02_SS	Ref.lab.-	0.0675	0.00675	0.0012	not relevan	not relevan	0.413223	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Be	W-SPM	HU-02_SS	Ref.lab.-	0.0675	0.00675	0.0012	not relevan	not relevan	13.22314	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	

Fig. 3.6.7. Evaluation of PAHs measured in the bottom sediment (S-2000) and suspended sediment (W-SPM) at the Berettyó, Pocsaj monitoring site. Red highlight indicates exceedance of EQS values.

Laboratory results from overbank sediment

The PAH concentrations from overbank sediment, both for the top soil and the bottom soil, are below all types of soil quality standards, except for Benzo(g,h,i)perylene, where the concentration is equal to the Bulgarian Normal Value EQS (background). Based on the overbank sediment samples at the Pocsaj monitoring site, there is no hazard posed via overbank sediment at the time of sampling. All of the PAH results from the bottom soil samples are below or equal to the LOQ. But some of the reference lab top soil results are above LOQ for Benzo(g,h,i)perylene=0.004 mg/kg; Indeno(1,2,3-cd)pyrene=0.004 mg/kg; Fluoranthene=0.003 mg/kg; Benzo(a)pyrene=0.002 mg/kg; Benzo(b)fluoranthene + Benzo(k)fluoranthene =0.005 mg/kg.

		3. Evaluate by Nationa	Support fields for Evaluation results 2/2.											
		3/1. Clear	Comperison to the lower QS limit value (Risk Ratio = C / QS)					Comperison to the Intervention QS limit values (Risk Ratio = C / QS)						
		3/2. See the results in c	Dutch pollution list	Romanian legislation		Bulgaria	Serbia "Official Gazette of RS", No. 30/2018 and 64/2019	Dutch pollution list	Hungarian legislation (6/2009 (IV. 14.))	Romanian legislation		Bulgaria	Serbia "Official Gazette of RS", No. 50/2012	
		3/3. See the risk ratio i	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	
		3/4. Free to add any te	floodplain sediment					floodplain sediment						
observedPropertyDeterminandCode	procedureAnalysedMatrix	sampleIdentifier	Remarks	R= C / Target value	R = C /Alert value for sensitive land use categori	R = C /Alert value for non-sensitive land use categori	R = C / BG_Normal value	R = C / SOIL_Maximum allowable concentratio	R= C / Interventi on value	R= C / Geological media	R = C/ Intervention value for sensitive land use	R = C/ Intervention value for non-sensitiv	R = C/ BG_Interve ntion value	R = C/ SOIL_Concentration at which remediation of sediments requir
CAS_120-12-7_Anthracene	F-2000	HU-02 FS BS	Ref.lab.-	n.d.	0.0001	0.00005	0.1	n.d.	n.d.	n.d.	0.00005	0.000005	0.001	n.d.
CAS_120-12-7_Anthracene	F-2000	HU-02 FS BS	Nat.lab.-	n.d.	0.001	0.0005	LOQ>limit	n.d.	n.d.	n.d.	0.0005	0.00005	0.01	n.d.
CAS_191-24-2_Benzo(g,h,i)perylene	F-2000	HU-02 FS BS	Ref.lab.-	n.d.	0.0002	0.0001	0.25	n.d.	n.d.	n.d.	0.0001	0.00001	0.01	n.d.
CAS_191-24-2_Benzo(g,h,i)perylene	F-2000	HU-02 FS BS	Nat.lab.-	n.d.	0.001	0.0005	LOQ>limit	n.d.	n.d.	n.d.	0.0005	0.00005	0.05	n.d.
CAS_193-39-5_Indeno(1,2,3-cd)pyrene	F-2000	HU-02 FS BS	Ref.lab.-	n.d.	n.d.	n.d.	0.090909	n.d.	n.d.	n.d.	n.d.	n.d.	0.005	n.d.
CAS_193-39-5_Indeno(1,2,3-cd)pyrene	F-2000	HU-02 FS BS	Nat.lab.-	n.d.	n.d.	n.d.	0.454545	n.d.	n.d.	n.d.	n.d.	n.d.	0.025	n.d.
CAS_205-99-2_Benzo(b)fluoranthene	F-2000	HU-02 FS BS	Nat.lab.-	n.d.	0.0025	0.001	n.d.	n.d.	n.d.	n.d.	0.001	0.0001	n.d.	n.d.
CAS_206-44-0_Fluoranthene	F-2000	HU-02 FS BS	Ref.lab.-	n.d.	0.0002	0.0001	0.066667	n.d.	n.d.	n.d.	0.0001	0.00001	0.01	n.d.
CAS_207-08-9_Benzo(k)fluoranthene	F-2000	HU-02 FS BS	Nat.lab.-	n.d.	0.0025	0.001	n.d.	n.d.	n.d.	n.d.	0.001	0.0001	n.d.	n.d.
CAS_50-32-8_Benzo(a)pyrene	F-2000	HU-02 FS BS	Ref.lab.-	n.d.	0.0005	0.0002	0.2	n.d.	n.d.	n.d.	0.0002	0.0001	0.01	n.d.
CAS_50-32-8_Benzo(a)pyrene	F-2000	HU-02 FS BS	Nat.lab.-	n.d.	0.0025	0.001	LOQ>limit	n.d.	n.d.	n.d.	0.001	0.0005	0.05	n.d.
EEA_32-23-5_Total Benzo(b)fluor-anthene (C/	F-2000	HU-02 FS BS	Ref.lab.-	n.d.	0.0005	0.0002	n.d.	n.d.	n.d.	n.d.	0.0002	0.00002	n.d.	n.d.
EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Be	F-2000	HU-02 FS BS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	0.004	0.0001	0.004	n.d.	n.d.	n.d.	0.0001
EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Be	F-2000	HU-02 FS BS	Nat.lab.-	n.d.	n.d.	n.d.	n.d.	0.005	0.000125	0.005	n.d.	n.d.	n.d.	0.000125
CAS_120-12-7_Anthracene	F-2000	HU-02 FS TS	Ref.lab.-	n.d.	0.0001	0.00005	0.1	n.d.	n.d.	n.d.	0.00005	0.000005	0.001	n.d.
CAS_120-12-7_Anthracene	F-2000	HU-02 FS TS	Nat.lab.-	n.d.	0.001	0.0005	LOQ>limit	n.d.	n.d.	n.d.	0.0005	0.00005	0.01	n.d.
CAS_191-24-2_Benzo(g,h,i)perylene	F-2000	HU-02 FS TS	Ref.lab.-	n.d.	0.0008	0.0004	1	n.d.	n.d.	n.d.	0.0004	0.00004	0.04	n.d.
CAS_191-24-2_Benzo(g,h,i)perylene	F-2000	HU-02 FS TS	Nat.lab.-	n.d.	0.001	0.0005	LOQ>limit	n.d.	n.d.	n.d.	0.0005	0.00005	0.05	n.d.
CAS_193-39-5_Indeno(1,2,3-cd)pyrene	F-2000	HU-02 FS TS	Ref.lab.-	n.d.	n.d.	n.d.	0.363636	n.d.	n.d.	n.d.	n.d.	n.d.	0.02	n.d.
CAS_193-39-5_Indeno(1,2,3-cd)pyrene	F-2000	HU-02 FS TS	Nat.lab.-	n.d.	n.d.	n.d.	0.454545	n.d.	n.d.	n.d.	n.d.	n.d.	0.025	n.d.
CAS_205-99-2_Benzo(b)fluoranthene	F-2000	HU-02 FS TS	Nat.lab.-	n.d.	0.0025	0.001	n.d.	n.d.	n.d.	n.d.	0.001	0.0001	n.d.	n.d.
CAS_206-44-0_Fluoranthene	F-2000	HU-02 FS TS	Ref.lab.-	n.d.	0.0006	0.0003	0.2	n.d.	n.d.	n.d.	0.0003	0.00003	0.03	n.d.
CAS_207-08-9_Benzo(k)fluoranthene	F-2000	HU-02 FS TS	Nat.lab.-	n.d.	0.0025	0.001	n.d.	n.d.	n.d.	n.d.	0.001	0.0001	n.d.	n.d.
CAS_50-32-8_Benzo(a)pyrene	F-2000	HU-02 FS TS	Ref.lab.-	n.d.	0.001	0.0004	0.4	n.d.	n.d.	n.d.	0.0004	0.0002	0.02	n.d.
CAS_50-32-8_Benzo(a)pyrene	F-2000	HU-02 FS TS	Nat.lab.-	n.d.	0.0025	0.001	LOQ>limit	n.d.	n.d.	n.d.	0.001	0.0005	0.05	n.d.
EEA_32-23-5_Total Benzo(b)fluor-anthene (C/	F-2000	HU-02 FS TS	Ref.lab.-	n.d.	0.0025	0.001	n.d.	n.d.	n.d.	n.d.	0.001	0.0001	n.d.	n.d.
EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Be	F-2000	HU-02 FS TS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	0.015	0.000375	0.015	n.d.	n.d.	n.d.	0.000375
EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Be	F-2000	HU-02 FS TS	Nat.lab.-	n.d.	n.d.	n.d.	n.d.	0.005	0.000125	0.005	n.d.	n.d.	n.d.	0.000125

Fig. 3.6.8. Evaluation of PAHs measured in the overbank (floodplain) sediment (F-2000) at the Berettyó, Pocsaj monitoring site. Note that all HS values are below the EQS values.

Conclusions for PAHs

The >LOQ concentrations in the overbank sediment top soil samples, and the >EQS concentrations in the water suspended sediment samples indicate some active pollution sources and that hazard from PAHs. The national regular monitoring system has selected this site for regular biota monitoring due to the PAH problems, and regular SPM monitoring is also suggested for this site. Every previous measurement in biota (fish) was under <LOQ and also $<EQS_{biota}$ in 2013-2019 monitoring cycle. However, the monitoring frequency should be higher. Based on Hungarian water monitoring program, almost all measurement results are under LOQ but the maxiumum of

Benzo(g,h,i)perylene=0.0154 mg/kg, which is higher than the MAC-EQS, thus, this site was classified for bad status due to the PAH concentrations in third RBMP.

Heating (burning wood, pallet or gas) of households alone cannot be responsible for the observed elevated PAH concentrations because the sampling time was at the end of May, after the winter heating period. The PAHs can remobilize from bottom sediment to suspended sediment, but in this case, it is not likely because the bottom sediment concentrations are usually under LOQ. Near this sampling site there is no any burning factory such as waste incinerator, power plant or cement factory.

Pesticides

Laboratory results from bottom sediment and suspended sediment

Concentration of Hexachlorocyclohexane and Quinoxyfen measured in the reference laboratory in bottom sediment and suspended sediment are all below LOQ. Based on bottom sediment results at the Berettyó monitoring site, there is no hazard for the bethics or water related ecosystems from these pesticides at the time of sampling.

Concentration of dicofol, hexachlorobenzene, heptachlor and heptachlor epoxide were also below LOQ but the EQS are very low, therefore, the hazard cannot be evaluated. Based on US EPA PEC value, the Elbe Tiver, the Rhine Basin and the Serbian thresholds, the benthics and water related

				Support fields for Evaluation results 1/2.						Support fields for Evaluation results 2/2.								
		3. Evaluate by National		QS values based on EQS			Comparisson to QS value based			Comperison to the lower QS limit			Comperison to the Intervention QS limit values (Risk Ratio =					
		3/1. Clear		2) CHS in <63um = CHS in <2mm			2) CHS in <63um = CHS in <2mm			Elbe basin (IKSE/ICPER 2018)	US EPA	Serbia "Official Gazette of RS", No. 50/2012	Elbe basin (IKSE/ICPER 2018)	Rhine basin (ICPR, 2009)	Rhine basin (ICPR, 2009)	US EPA	Serbia "Official Gazette of RS", No. 50/2012	
		3/2. See the results in c		S-2000	S-2000	W-SPM	S-2000	S-2000	W-SPM	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	
		3/3. See the risk ratio i								bottom sediment			bottom sediment					
		3/4. Free to add any text in column AM and AN.																
observedPropertyDeterminandCode	procedureAnalysedMatrix	sampleIdentifier	Remarks	QS benthic, freshwater	EQSsed.	EQSsusp.	R = C / QS benthic, freshwater	R = C / EQSsed.	R = C / EQSsusp.	R= C / Lower threshold	R= C / TEC	R = C / EQS for sediment quality Target Concentratio	R= C / Upper Threshold	R= C / poor	R= C / bad	R= C / PEC	R = C / SED_Maximum allowable concentratio	
CAS_115-32-2_Dicofol	S-2000	HU-02 BS	Ref.lab.-	0.00033	0.00033	7E-05	LOQ>limit	LOQ>limit	not relevan	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
CAS_76-44-8_Heptachlor	S-2000	HU-02 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevan	n.d.	n.d.	0.003571429	n.d.	n.d.	n.d.	n.d.	3.67647E-05	
CAS_1024-57-3_Heptachlor epoxide	S-2000	HU-02 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevan	n.d.	LOQ>limit	LOQ>limit valu	n.d.	n.d.	n.d.	0.15625	LOQ>limit value	
CAS_608-73-1_Hexachlorocyclohexane	S-2000	HU-02 BS	Ref.lab.-	0.0103	0.0103	0.0108	0.242718	0.242718	not relevan	LOQ>limit	LOQ>limit	0.00025	LOQ>limit	n.d.	n.d.	LOQ>limit	n.d.	
CAS_118-74-1_Hexachlorobenzene	S-2000	HU-02 BS	Ref.lab.-	0	0.000299	0.0025	n.d.	LOQ>limit	not relevan	LOQ>limit	n.d.	n.d.	0.147059	0.015625	0.007813	n.d.	n.d.	
CAS_124495-18-7_Quinoxyfen	S-2000	HU-02 BS	Ref.lab.-	0.0055	0.0055	0.0274	0.454545	0.454545	not relevan	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
EEA_33-50-1_Heptachlor and heptachlor epox	S-2000	HU-02 BS	Ref.lab.-	0.000015	1.05E-07	3E-06	LOQ>limit	LOQ>limit	not relevan	n.d.	LOQ>limit	n.d.	n.d.	n.d.	n.d.	0.15625	n.d.	
CAS_608-73-1_Hexachlorocyclohexane	S-2000	HU-02 BS	Ref.lab.-	0.0103	0.0103	0.0108	0.242718	0.242718	not relevan	LOQ>limit	LOQ>limit	0.00025	LOQ>limit	n.d.	n.d.	LOQ>limit	n.d.	
CAS_115-32-2_Dicofol	W-SPM	HU-02_SS	Ref.lab.-	0.00033	0.00033	7E-05	not relevan	not relevan	LOQ>limit	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_76-44-8_Heptachlor	W-SPM	HU-02_SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_1024-57-3_Heptachlor epoxide	W-SPM	HU-02_SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_608-73-1_Hexachlorocyclohexane	W-SPM	HU-02_SS	Ref.lab.-	0.0103	0.0103	0.0108	not relevan	not relevan	0.231481	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_118-74-1_Hexachlorobenzene	W-SPM	HU-02_SS	Ref.lab.-	0	0.000299	0.0025	not relevan	not relevan	LOQ>limit	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_124495-18-7_Quinoxyfen	W-SPM	HU-02_SS	Ref.lab.-	0.0055	0.0055	0.0274	not relevan	not relevan	0.091241	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
EEA_33-50-1_Heptachlor and heptachlor epox	W-SPM	HU-02_SS	Ref.lab.-	0.000015	1.05E-07	3E-06	not relevan	not relevan	LOQ>limit	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_608-73-1_Hexachlorocyclohexane	W-SPM	HU-02_SS	Ref.lab.-	0.0103	0.0103	0.0108	not relevan	not relevan	0.231481	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	

Fig. 3.6.9. Evaluation of Pesticides measured in bottom sediment (S-2000) and suspended sediment (W-SPM) at the Berettyó, Pocsaj monitoring site. Note that all HS values are below the EQS values.

Laboratory results from overbank sediment

Most of the Danube Countries have no quality standard for WFD pesticides. All the laboratory results were below LOQ, so there is no reason to protect water quality via overbank sediment.

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

		3. Evaluate by Nationa	Support fields for Evaluation results 2/2.										
		3/1. Clear	Comperison to the lower QS limit value (Risk Ratio = C / QS)					Comperison to the Intervention QS limit values (Risk Ratio = C / QS)					
		3/2. See the results in c	Dutch pollution list	Romanian legislation		Bulgaria	Serbia "Official Gazette of RS", No. 30/2018 and 64/2019	Dutch pollution list	Hungarian legislation (6/2009 (IV. 14.))	Romanian legislation		Bulgaria	Serbia "Official Gazette of RS", No. 50/2012
		3/3. See the risk ratio i	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000
		3/4. Free to add any te	floodplain sediment					floodplain sediment					
observedPropertyDeterminandCode	procedureAnalysedMatrix	sampleIdentifier	Remarks	R= C / Target value	R = C /Alert value for sensitive land use categori	R = C /Alert value for non-sensitive land use categori	R = C / BG_Normal value	R = C / SOIL_Maximum allowable concentratio	R= C / Intervention value	R= C / Geological media	R = C/ Intervention value for sensitive land use	R = C/ Intervention value for non-sensitiv	R = C/ BG_Intervention valu	R = C/ SOIL_Concentration at which remediation of sediments is requir
CAS_115-32-2_Dicofol	F-2000	HU-02 FS BS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CAS_115-32-2_Dicofol	F-2000	HU-02 FS TS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CAS_76-44-8_Heptachlor	F-2000	HU-02 FS BS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	LOQ>limit value	0.000625	n.d.	n.d.	n.d.	n.d.	0.000625
CAS_76-44-8_Heptachlor	F-2000	HU-02 FS TS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	LOQ>limit value	0.000625	n.d.	n.d.	n.d.	n.d.	0.000625
CAS_1024-57-3_Heptachlor epoxide	F-2000	HU-02 FS BS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	LOQ>limit value	0.000625	n.d.	n.d.	n.d.	n.d.	0.000625
CAS_1024-57-3_Heptachlor epoxide	F-2000	HU-02 FS TS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	LOQ>limit value	0.000625	n.d.	n.d.	n.d.	n.d.	0.000625
CAS_608-73-1_Hexachlorocyclohexane	F-2000	HU-02 FS BS	Ref.lab.-	n.d.	0.01	0.005	n.d.	0.25	n.d.	0.025	0.0033333	0.00125	0.25	0.00125
CAS_608-73-1_Hexachlorocyclohexane	F-2000	HU-02 FS TS	Ref.lab.-	n.d.	0.01	0.005	n.d.	0.25	n.d.	0.025	0.0033333	0.00125	0.25	0.00125
CAS_118-74-1_Hexachlorobenzene	F-2000	HU-02 FS BS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	n.d.	0.00125	n.d.	n.d.	n.d.	0.01	n.d.
CAS_118-74-1_Hexachlorobenzene	F-2000	HU-02 FS TS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	n.d.	0.00125	n.d.	n.d.	n.d.	0.01	n.d.
CAS_124495-18-7_Quinoxyfen	F-2000	HU-02 FS BS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
CAS_124495-18-7_Quinoxyfen	F-2000	HU-02 FS TS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
EEA_33-50-1_Heptachlor and heptachlor epox	F-2000	HU-02 FS BS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	n.d.	0.000625	n.d.	n.d.	n.d.	n.d.	n.d.
EEA_33-50-1_Heptachlor and heptachlor epox	F-2000	HU-02 FS TS	Ref.lab.-	n.d.	n.d.	n.d.	n.d.	n.d.	0.000625	n.d.	n.d.	n.d.	n.d.	n.d.
CAS_608-73-1_Hexachlorocyclohexane	F-2000	HU-02 FS BS	Ref.lab.-	n.d.	0.01	0.005	n.d.	0.25	n.d.	0.025	0.0033333	0.00125	0.25	0.00125
CAS_608-73-1_Hexachlorocyclohexane	F-2000	HU-02 FS TS	Ref.lab.-	n.d.	0.01	0.005	n.d.	0.25	n.d.	0.025	0.0033333	0.00125	0.25	0.00125

Fig. 3.6.10.Evaluation of Pesticides measured in the overbank (floodplain) sediment (F-2000) at the Berettyó, Pocsaj monitoring site. Note that all the Pesticide concentrations are below the LOQ values.

Conclusions for pesticides

Based on sediment results, there is no need for detailed monitoring for the selected pesticides in the sediment. The biota and passive membrane sampling methods should be sufficient.

Metals

Laboratory results from bottom sediment and suspended sediment

EQSsed and EQSsusp were delivered for Lead and Nickel based on EQS dossiers data. For these compounds, based on bottom sediment results at Berettyó monitoring site, there is no hazard for the benthics or water related ecosystems from these metals at the time of sampling. Lead from suspended particular matter is 1.2 times higher than the EQSsusp.

Lead, mercury and nickel results indicate some risk (warning level) based on Elbe River lower threshold and US EPA TEC value. Based on upper intervention thresholds, the site is in good status for all metals

				Support fields for Evaluation results 1/2.						Support fields for Evaluation results 2/2.								
		3. Evaluate by Nation		QS values based on EQS			Comparisson to QS value based			Comperison to the lower QS limit			Comperison to the Intervention QS limit values (Risk Ratio =					
		3/1. Clear		2) CHS in <63um = CHS in <2mm			2) CHS in <63um = CHS in <2mm			Elbe basin (IKSE/ICPER 2018)	US EPA	Serbia "Official Gazette of RS", No. 50/2012	Elbe basin (IKSE/ICPER 2018)	Rhine basin (ICPR, 2009)	Rhine basin (ICPR, 2009)	US EPA	Serbia "Official Gazette of RS", No. 50/2012	
		3/2. See the results in		S-2000	S-2000	W-SPM	S-2000	S-2000	W-SPM	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	
		3/3. See the risk ratio								bottom sediment			bottom sediment					
		3/4. Free to add any te																
observedPropertyDeterminandCode	procedureAnalysedMatrix	sampleIdentifier	Remarks	QS benthic, freshwater	EQSsed.	EQSsusp.	R = C / QS benthic, freshwater	R = C / EQSsed.	R = C / EQSsusp.	R= C / Lower threshold	R= C / TEC	R = C / EQS for sediment quality Target Concentratio	R= C / Upper Threshold	R= C / poor	R= C / bad	R= C / PEC	R = C / SED_Maximum allowable concentratio	
CAS_7439-92-1_Lead and its compounds	S-2000	HU-02 BS	Ref.lab.-	41	131	23	0.199268	0.062366	not relevan	0.3268	0.228212	0.096117647	0.154151	0.020425	0.010213	0.063828	0.026354839	
CAS_7439-92-1_Lead and its compounds	S-2000	HU-02 BS	Nat.lab.-	41	131	23	0.736585	0.230534	not relevan	1.208	0.843575	0.355294118	0.569811	0.0755	0.03775	0.235938	0.097419355	
CAS_7439-97-6_Mercury and its compounds	S-2000	HU-02 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevan	1.133333	0.944444	0.566666667	0.361702	0.085	0.0425	0.160377	0.10625	
CAS_7439-97-6_Mercury and its compounds	S-2000	HU-02 BS	Nat.lab.-	0	0	0	n.d.	n.d.	not relevan	0.333333	0.277778	0.166666667	0.106383	0.025	0.0125	0.04717	0.03125	
CAS_7440-02-0_Nickel and its compounds	S-2000	HU-02 BS	Ref.lab.-	56.632	56.632	75.445	0.24721	0.24721	not relevan	4.666667	0.61674	0.4	0.264151	0.07	0.035	0.288066	0.318181818	
CAS_7440-02-0_Nickel and its compounds	S-2000	HU-02 BS	Nat.lab.-	56.632	56.632	75.445	0.309013	0.309013	not relevan	5.833333	0.770925	0.5	0.330189	0.0875	0.04375	0.360082	0.397727273	
CAS_7440-38-2_Arsenic and its compounds	S-2000	HU-02 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevan	0.810127	0.653728	0.220689655	0.16	n.d.	n.d.	0.193939	0.152380952	
CAS_7440-43-9_Cadmium and its compounds	S-2000	HU-02 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevan	0.5	0.111111	0.1375	0.047826	0.0275	0.01375	0.022088	0.0171875	
CAS_7440-43-9_Cadmium and its compounds	S-2000	HU-02 BS	Nat.lab.-	0	0	0	n.d.	n.d.	not relevan	7.636364	1.69697	2.1	0.730435	0.42	0.21	0.337349	0.2625	
CAS_7440-47-3_Chromium and its compounds	S-2000	HU-02 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevan	0.965385	0.578341	0.251	0.039219	n.d.	n.d.	0.226126	0.104583333	
CAS_7440-47-3_Chromium and its compounds	S-2000	HU-02 BS	Nat.lab.-	0	0	0	n.d.	n.d.	not relevan	0.892308	0.534562	0.232	0.03625	n.d.	n.d.	0.209009	0.096666667	
CAS_7440-50-8_Copper and its compounds	S-2000	HU-02 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevan	0.714286	0.316456	0.277777778	0.0625	0.05	0.025	0.067114	0.090909091	
CAS_7440-50-8_Copper and its compounds	S-2000	HU-02 BS	Nat.lab.-	0	0	0	n.d.	n.d.	not relevan	0.835714	0.370253	0.325	0.073125	0.0585	0.02925	0.078523	0.106363636	
CAS_7440-66-6_Zinc and its compounds	S-2000	HU-02 BS	Ref.lab.-	0	0	0	n.d.	n.d.	not relevan	0.183	0.302479	0.261428571	0.04575	0.04575	0.022875	0.079739	0.085116279	
CAS_7440-66-6_Zinc and its compounds	S-2000	HU-02 BS	Nat.lab.-	0	0	0	n.d.	n.d.	not relevan	0.183	0.302479	0.261428571	0.04575	0.04575	0.022875	0.079739	0.085116279	
CAS_7439-92-1_Lead and its compounds	W-SPM	HU-02_SS	Ref.lab.-	41	131	23	not relevan	not relevan	1.165217	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_7439-97-6_Mercury and its compounds	W-SPM	HU-02_SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_7440-02-0_Nickel and its compounds	W-SPM	HU-02_SS	Ref.lab.-	56.632	56.632	75.445	not relevan	not relevan	0.62297	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_7440-38-2_Arsenic and its compounds	W-SPM	HU-02_SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_7440-43-9_Cadmium and its compounds	W-SPM	HU-02_SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_7440-47-3_Chromium and its compounds	W-SPM	HU-02_SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_7440-50-8_Copper and its compounds	W-SPM	HU-02_SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	
CAS_7440-66-6_Zinc and its compounds	W-SPM	HU-02_SS	Ref.lab.-	0	0	0	not relevan	not relevan	n.d.	not relevan	not relevan	not relevant	not relevan	not relevan	not relevan	not relevan	not relevant	

Fig. 3.6.11. Evaluation of Metals measured in the bottom sediment (S-2000) and suspended sediment (W-SPM) at the Berettyó, Pocsaj monitoring site. Red highlight indicates exceedance of EQS values.

Laboratory results from overbank sediment

The metals from the overbank sediment bottom soil are below all country intervention soil quality standards, except cadmium by the Hungarian national soil standard. The concentration of cadmium in bottom soil layer is 1.5 times, and in top soil layer 1.97 times higher than the limit value. Based on Bulgarian 'normal value' standards (natural background), mercury is 4.3 and 5 times higher and cadmium is 3.9 and 4.9 times higher in the bottom and in top soils than these limit values. Cadmium results both in the bottom and top soil samples are above the Dutch List target value and Serbian lower limit.

Conclusions for metals

Based on bottom, suspended and overbank sediment samples, there is no hazard for the benthics or water related ecosystems from these metals at the time of sampling. Although the regular monitoring of metals, mainly for lead, nickel, mercury and cadmium is important, and trend evaluation is also suggested. The most suitable sediment matrix can be the bottom sediment, but site-specific EQS for metals at Berettyó river is also needed for proper risk assessment.

Based on Hungarian regular water monitoring data, the Berettyó water body is in bad status due to the high mercury, lead, arsenic and cadmium concentrations.

Mercury: Its condition is unsatisfactory at all sampling points, including Pocsaj, based on biota monitoring (2.5-6.5 times exceedances were observed). In the case of Pocsaj and Szeghalom sampling sites, Berettyó is also in poor condition due to the MAC-EQS exceedance (1.2-1.6 times exceedance). Monitoring is frequent and regular, but the majority of the water phase results (77% at Pocsaj) are below LOQ and the average at all sampling points is below LOQ (typical LOQ is 0.02 µg / l).

Lead: The water body is not risky for lead. The average concentration At Pocsaj is 32% of the limit value. However, the measured concentration exceeded the MAC-EQS at 3 sampling points.

				Support fields for Evaluation results 2/2.										
				Comperison to the lower QS limit value (Risk Ratio = C / QS)					Comperison to the Intervention QS limit values (Risk Ratio = C / QS)					
				Dutch pollution list	Romanian legislation		Bulgaria	Serbia "Official Gazette of RS", No. 30/2018 and 64/2019	Dutch pollution list	Hungarian legislation (6/2009 (IV. 14.))	Romanian legislation		Bulgaria	Serbia "Official Gazette of RS", No. 50/2012
				F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000
				floodplain sediment					floodplain sediment					
observedPropertyDeterminandCode	procedureAnalysedMatrix	sampleIdentifier	Remarks	R= C / Target value	R = C /Alert value for sensitive land use categori	R = C /Alert value for non-sensitive land use categori	R = C / BG_Normal value	R = C / SOIL_Maximum allowable concentratio	R= C / Interventi on value	R= C / Geological media	R = C/ Intervention value for sensitive land use	R = C/ Intervention value for non-sensitiv	R = C/ BG_Interve ntion valu	R = C/ SOIL_Concentration at which remediation of sediments is requir
CAS_7440-38-2_Arsenic and its compounds	F-2000	HU-02 FS BS	Ref.lab.-	0.136552	0.264	0.1584	0.396	0.136551724	0.072	0.264	0.1584	0.0792	0.044	0.072
CAS_7440-43-9_Cadmium and its compounds	F-2000	HU-02 FS BS	Ref.lab.-	0.15	0.04	0.024	0.3	0.15	0.01	0.12	0.024	0.012	0.01	0.01
CAS_7440-47-3_Chromium and its compounds	F-2000	HU-02 FS BS	Ref.lab.-	0.434	0.434	0.144666667	0.667692	0.434	0.114211	0.578667	0.1446667	0.0723333	0.078909	0.114210526
CAS_7440-50-8_Copper and its compounds	F-2000	HU-02 FS BS	Ref.lab.-	0.322222	0.116	0.0464	0.341176	0.322222222	0.061053	0.154667	0.058	0.0232	0.0232	0.061052632
CAS_7439-97-6_Mercury and its compounds	F-2000	HU-02 FS BS	Ref.lab.-	0.433333	0.13	0.0325	4.333333	0.433333333	0.013	0.26	0.065	0.013	0.013	0.013
CAS_7440-02-0_Nickel and its compounds	F-2000	HU-02 FS BS	Ref.lab.-	0.46	0.214666667	0.0805	0.35	0.46	0.076667	0.4025	0.1073333	0.0322	0.053667	0.076666667
CAS_7439-92-1_Lead and its compounds	F-2000	HU-02 FS BS	Ref.lab.-	0.097765	0.1662	0.03324	0.319615	0.097764706	0.015679	0.0831	0.0831	0.00831	0.01662	0.015679245
CAS_7440-66-6_Zinc and its compounds	F-2000	HU-02 FS BS	Ref.lab.-	0.285714	0.133333333	0.057142857	0.454545	0.285714286	0.055556	0.2	0.0666667	0.0266667	0.044444	0.055555556
CAS_7440-43-9_Cadmium and its compounds	F-2000	HU-02 FS BS	Nat.lab.-	1.95	0.52	0.312	3.9	1.95	0.13	1.56	0.312	0.156	0.13	0.13
CAS_7440-47-3_Chromium and its compounds	F-2000	HU-02 FS BS	Nat.lab.-	0.287	0.287	0.095666667	0.441538	0.287	0.075526	0.382667	0.0956667	0.0478333	0.052182	0.075526316
CAS_7440-50-8_Copper and its compounds	F-2000	HU-02 FS BS	Nat.lab.-	0.308333	0.111	0.0444	0.326471	0.308333333	0.058421	0.148	0.0555	0.0222	0.0222	0.058421053
CAS_7439-97-6_Mercury and its compounds	F-2000	HU-02 FS BS	Nat.lab.-	0.166667	0.05	0.0125	LOQ>limit	0.166666667	0.005	0.1	0.025	0.005	0.005	0.005
CAS_7440-02-0_Nickel and its compounds	F-2000	HU-02 FS BS	Nat.lab.-	0.565714	0.264	0.099	0.430435	0.565714286	0.094286	0.495	0.132	0.0396	0.066	0.094285714
CAS_7439-92-1_Lead and its compounds	F-2000	HU-02 FS BS	Nat.lab.-	0.088	0.1496	0.02992	0.287692	0.088	0.014113	0.0748	0.0748	0.00748	0.01496	0.014113208
CAS_7440-66-6_Zinc and its compounds	F-2000	HU-02 FS BS	Nat.lab.-	0.277857	0.129666667	0.055571429	0.442045	0.277857143	0.054028	0.1945	0.0648333	0.0259333	0.043222	0.054027778
CAS_7440-38-2_Arsenic and its compounds	F-2000	HU-02 FS TS	Ref.lab.-	0.191379	0.37	0.222	0.555	0.19137931	0.100909	0.37	0.222	0.111	0.061667	0.100909091
CAS_7440-43-9_Cadmium and its compounds	F-2000	HU-02 FS TS	Ref.lab.-	0.2375	0.063333333	0.038	0.475	0.2375	0.015833	0.19	0.038	0.019	0.015833	0.015833333
CAS_7440-47-3_Chromium and its compounds	F-2000	HU-02 FS TS	Ref.lab.-	0.389	0.389	0.129666667	0.598462	0.389	0.102368	0.518667	0.1296667	0.0648333	0.070727	0.102368421
CAS_7440-50-8_Copper and its compounds	F-2000	HU-02 FS TS	Ref.lab.-	0.411111	0.148	0.0592	0.435294	0.411111111	0.077895	0.197333	0.074	0.0296	0.0296	0.077894737
CAS_7439-97-6_Mercury and its compounds	F-2000	HU-02 FS TS	Ref.lab.-	0.5	0.15	0.0375	5	0.5	0.015	0.3	0.075	0.015	0.015	0.015
CAS_7440-02-0_Nickel and its compounds	F-2000	HU-02 FS TS	Ref.lab.-	0.58	0.270666667	0.1015	0.441304	0.58	0.096667	0.5075	0.1353333	0.0406	0.067667	0.096666667
CAS_7439-92-1_Lead and its compounds	F-2000	HU-02 FS TS	Ref.lab.-	0.151765	0.258	0.0516	0.496154	0.151764706	0.02434	0.129	0.129	0.0129	0.0258	0.024339623
CAS_7440-66-6_Zinc and its compounds	F-2000	HU-02 FS TS	Ref.lab.-	0.385714	0.18	0.077142857	0.613636	0.385714286	0.075	0.27	0.09	0.036	0.06	0.075
CAS_7440-43-9_Cadmium and its compounds	F-2000	HU-02 FS TS	Nat.lab.-	2.4625	0.656666667	0.394	4.925	2.4625	0.164167	1.97	0.394	0.197	0.164167	0.164166667
CAS_7440-47-3_Chromium and its compounds	F-2000	HU-02 FS TS	Nat.lab.-	0.369	0.369	0.123	0.567692	0.369	0.097105	0.492	0.123	0.0615	0.067091	0.097105263
CAS_7440-50-8_Copper and its compounds	F-2000	HU-02 FS TS	Nat.lab.-	0.425	0.153	0.0612	0.45	0.425	0.080526	0.204	0.0765	0.0306	0.0306	0.080526316
CAS_7439-97-6_Mercury and its compounds	F-2000	HU-02 FS TS	Nat.lab.-	0.166667	0.05	0.0125	LOQ>limit	0.166666667	0.005	0.1	0.025	0.005	0.005	0.005
CAS_7440-02-0_Nickel and its compounds	F-2000	HU-02 FS TS	Nat.lab.-	0.688571	0.321333333	0.1205	0.523913	0.688571429	0.114762	0.6025	0.1606667	0.0482	0.080333	0.114761905
CAS_7439-92-1_Lead and its compounds	F-2000	HU-02 FS TS	Nat.lab.-	0.118824	0.202	0.0404	0.388462	0.118823529	0.019057	0.101	0.101	0.0101	0.0202	0.019056604
CAS_7440-66-6_Zinc and its compounds	F-2000	HU-02 FS TS	Nat.lab.-	0.385	0.179666667	0.077	0.6125	0.385	0.074861	0.2695	0.0898333	0.0359333	0.059889	0.074861111

Fig. 3.6.12. Evaluation of Metals measured in the overbank sediment (F-2000) at the Berettyó monitoring site. Red highlight indicates exceedance of EQS values.

Zinc: Good condition based on regular water phase monitoring. At Pocsaj, the average Zn concentration is 27% of AA-EQS, MAC-EQS is not valid.

Nickel: Based on regular water phase monitoring, the water body is in good condition based on both average concentrations and maximum allowable concentrations. At Pocsaj, the average concentration is 35% of AA-EQS, maximum value is 44% of MAC-EQS.

Chromium: Based on regular monitoring of the aqueous phase, the water body is in good condition based on both average concentrations and maximum allowable concentrations. At Pocsaj, the average concentration is 30% of AA-EQS, maximum value is 24% of MAC-EQS.

Arsenic: The average arsenic concentration in the water body is not risky (average concentration At Pocsaj is 46.7% of the limit value, 49 at the sampling point). However, the measured concentration exceeded the MAC-EQS at 2 sampling points.

Cadmium: The condition at the monitoring point of Pocsaj is unsatisfactory based on the water phase monitoring (3-fold exceedance of AA-EQS). The Berettyó water body is also in poor condition due to the cadmium MAC-EQS exceedance (2-fold exceedance). Monitoring is frequent and regular, and the water phase results are all above LOQ At Pocsaj.

Closing remarks for both Hungarian sites

There is an uncertainty in the results reflected in the difference between the national and reference laboratory results. Therefore, for better risk assessment at least 3 sediment samples per year are required, and better laboratory intercalibration process for metals is needed.

3.7. REPUBLIC OF MOLDAVIA

MD-01 – Beleu Lake

EQS dossier

Bottom sediment

At location MD-01, according to EQS dossier both national and reference laboratory analyses showed elevated concentrations of Fluoranthene, Total Benzo(b)fluoranthene + Benzo(k)fluoranthene and Total PAHs. In addition, the reference laboratory determined elevated concentrations of Benzo(a)pyrene and Benzo(g,h,i)perylene. For these substances, the status is "risky" and "bad". The risk ratio varies between 1 and 46.10 (Fig. 3.7.1).

National standards

Bottom sediment

According to national standards, all the listed substances have the status "risky" and "good", because Benzo(a)pyrene is above Elbe lower limit and also above Serbia "Official Gazette of RS", both in national and reference laboratory measurement (Fig. 3.7.2). Cadmium and Nickel are also above Elbe QS lower limit (national laboratory). Other "risky" susbtances are: Benzo(a)anthracene, Anthracene, Benzo(a)pyrene and Fluoranthene (national and reference laboratory).

MD-02 – Costești – Stânca

EQS dossier

Bottom sediment

According tu EQS dossier, elevated concentrations of Fluoranthene, Benzo(a)pyrene, Total Benzo(b)fluoranthene + Benzo(k)fluoranthene and Total PAHs were determined by both national and reference laboratories (Fig. 3.7.3). At the same location, national laboratory measured elevated concentrations of Anthracene, while the reference laboratory measured elevated concentrations of Benzo(g,h,i)perylene. For these substances, the status is "risky" and "bad". The risk ratio is between 1 and 33.18.

National standards

Bottom sediment

According to national standards (Fig. 3.7.4), the substances with "risky" and "good" status, i.e. above the lower QS limit values are: Benzo(a)anthracene (Serbia "Official Gazette of RS") and Fluorene (US EPA). Anthracene and Fluoranthene are above the lower QS limit values (Serbia "Official Gazette of RS"), both in the national and reference laboratory analyses, while Benzo(a)pyrene is also above Elbe Lower Threshold.

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

	B	F	J	K	W	X	Y	Z	AC	AD	AE	AH	AI	AJ
1	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National		Evaluation results 1/2. Based on EQS dossiers				Support fields for Evaluation results 1/2. QS values based on EQS dossiers			Comparisson to QS value based on EQS dossiers (Risk Ratio = C / QS)		
2	1. Filter to your country in column J! (eg. write	2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL		Risky / Not risky / unknown	Good / Bad / unkn own	Evaluation result text	Evalution result notes	QS benthic, freshwater	EQSsed.	EQSsusp.	R = C / QS benthic, freshwater	R = C / EQSsed.	R = C / EQSsusp.
3		2/2. See the results in column	3/2. See the result						2) CHS in <63um = CHS in <2mm					
4		2/3. See the risk ratio in the co	3/3. See the risk ra						S-2000	S-2000	W-SPM	S-2000	S-2000	W-SPM
5		2/4. Free to add any text in col	3/4. Free to add an											
6	Samp	observedPropertyDeterminan	sampleIden	res	observe	lue								
282	Natlab_	CAS_50-32-8_Benzo(a)pyrene	MD-01 BS	0.038	Risky	Bad			0.0915	0.00707	0.001	0.415301	5.374823	not relevan
296	Reflab_I	CAS_191-24-2_Benzo(g,h,i)perylen	MD-01 BS	0.042	Risky	Bad			0.042	0.042	0.073	1	1	not relevan
306	Reflab_I	CAS_50-32-8_Benzo(a)pyrene	MD-01 BS	0.046	Risky	Bad			0.0915	0.00707	0.001	0.502732	6.506365	not relevan
432	Natlab_	EEA_32-23-5_Total Benzo(b)fluor	MD-01 BS	0.105	Risky	Bad			0.0675	0.00675	0.001	1.555556	15.55556	not relevan
436	Reflab_I	EEA_32-23-5_Total Benzo(b)fluor	MD-01 BS	0.107	Risky	Bad			0.0675	0.00675	0.001	1.585185	15.85185	not relevan
450	Natlab_	CAS_206-44-0_Fluoranthene	MD-01 BS	0.118	Risky	Bad			2	0.00308	0.006	0.059	38.31169	not relevan
494	Reflab_I	CAS_206-44-0_Fluoranthene	MD-01 BS	0.142	Risky	Bad			2	0.00308	0.006	0.071	46.1039	not relevan
3625	_MD-01	EEA_33-56-7_Total PAHs (Benzo(a	MD-01 BS	0.246	Risky	Bad			0.0675	0.00675	0.001	3.644444	36.44444	not relevan
3740	_MD-01	EEA_33-56-7_Total PAHs (Benzo(a	MD-01 BS	0.216	Risky	Bad			0.0675	0.00675	0.001	3.2	32	not relevan
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	B	F	J	K	AK	AL	AM	AN	BH	BI	BJ	BP	BQ	BR	BS	BT
1	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National		Evaluation results 2/2.				Support fields for Evaluation results 2/2.							
2	1. Filter to your country in column J! (eg. write	2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL		Based on other limit values (see on the right side)				Comperison to the lower QS limit value (Risk Ratio = C / QS)			Comperison to the Intervention QS limit values (Risk Ratio = C / QS)				
3		2/2. See the results in column	3/2. See the result		Risky / Not risky / unknown	Good / Bad / unknown status	Evaluation result text	Evalution result notes	Elbe basin (IKSE/ICPER 2018)	US EPA	"Official Gazette of RS", No. 50/2012	Elbe basin (IKSE/ICPER 2018)	Rhine basin (ICPR, 2009)	Rhine basin (ICPR, 2009)	US EPA	"Official Gazette of RS", No. 50/2012
4		2/3. See the risk ratio in the co	3/3. See the risk ra						S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000
5		2/4. Free to add any text in col	3/4. Free to add an						bottom sediment			bottom sediment				
6	Sam	observedPropertyDeterminan	sampleIden	res	Observe	lue			R= C / Lower threshold	R= C / TEC	R= C / EQS for sediment quality Target Concentra tion	R= C / Upper Threshold	R= C / poor	R= C / bad	R= C / PEC	R= C / SED_Maximum allowable concentration
76	Natlab_	CAS_56-55-3_Benzo(a)anthracene	MD-01 BS	0.005	Risky	Good			n.d.	0.046296	1.666667	n.d.	n.d.	n.d.	0.004762	0.0125
151	Reflab_J	CAS_120-12-7_Anthracene	MD-01 BS	0.011	Risky	Good			0.366667	0.000192	11	0.035484	n.d.	n.d.	0.013018	0.11
193	Natlab_	CAS_120-12-7_Anthracene	MD-01 BS	0.018	Risky	Good			0.583333	0.000306	17.5	0.056452	n.d.	n.d.	0.02071	0.175
282	Natlab_	CAS_50-32-8_Benzo(a)pyrene	MD-01 BS	0.038	Risky	Good			3.8	0.253333	12.66667	0.063333	0.02375	0.011875	0.026207	0.012667
306	Reflab_J	CAS_50-32-8_Benzo(a)pyrene	MD-01 BS	0.046	Risky	Good			4.6	0.306667	15.33333	0.076667	0.02875	0.014375	0.031724	0.015333
450	Natlab_	CAS_206-44-0_Fluoranthene	MD-01 BS	0.118	Risky	Good			0.655556	0.27896	3.933333	0.472	n.d.	n.d.	0.052915	0.039333
494	Reflab_J	CAS_206-44-0_Fluoranthene	MD-01 BS	0.142	Risky	Good			0.788889	0.335697	4.733333	0.568	n.d.	n.d.	0.063677	0.047333
696	Natlab_	CAS_7440-43-9_Cadmium and its c	MD-01 BS	0.4	Risky	Good			1.818182	0.40404	0.5	0.173913	0.1	0.05	0.080321	0.0625
889	Natlab_	CAS_7440-02-0_Nickel and its com	MD-01 BS	3.65	Risky	Good			1.216667	0.160793	0.104286	0.068868	0.01825	0.009125	0.075103	0.082955
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Fig. 3.7.3

	B	F	J	K	W	X	Y	Z	AC	AD	AE	AH	AI	AJ
1	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National		Evaluation results 1/2. Based on EQS dossiers				Support fields for Evaluation results 1/2. QS values based on EQS dossiers			Comparisson to QS value based on EQS dossiers (Risk Ratio = C / QS)		
2	1. Filter to your country in column J! (eg. write	2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL		Risky / Not risky / unknown	Good / Bad / unkn own	Evaluation text	Evalution result notes	QS benthic, freshwater	EQSsed.	EQSsusp.	R = C / QS benthic, freshwater	R = C / EQSsed.	R = C / EQSsusp.
3		2/2. See the results in column	3/2. See the result						2) CHS in <63um = CHS in <2mm			2) CHS in <63um = CHS in <2mm		
4		2/3. See the risk ratio in the co	3/3. See the risk ra						S-2000	S-2000	W-SPM	S-2000	S-2000	W-SPM
5		2/4. Free to add any text in col	3/4. Free to add an											
6	Samp	observedPropertyDeterminan	sampleIden	res	Value									
224	Natlab_	CAS_120-12-7_Anthracene	MD-02 BS	0.024	Risky	Bad			0.024	0.15	0.029	1	0.16	not relevat
231	Natlab_	CAS_50-32-8_Benzo(a)pyrene	MD-02 BS	0.025	Risky	Bad			0.0915	0.00707	0.001	0.273224	3.536068	not relevat
290	Reflab_	CAS_50-32-8_Benzo(a)pyrene	MD-02 BS	0.04	Risky	Bad			0.0915	0.00707	0.001	0.437158	5.657709	not relevat
300	Reflab_	CAS_191-24-2_Benzo(g,h,i)peryler	MD-02 BS	0.044	Risky	Bad			0.042	0.042	0.073	1.047619	1.047619	not relevat
361	Natlab_	CAS_206-44-0_Fluoranthene	MD-02 BS	0.066	Risky	Bad			2	0.00308	0.006	0.033	21.42857	not relevat
388	Natlab_	EEA_32-23-5_Total Benzo(b)fluor	MD-02 BS	0.085	Risky	Bad			0.0675	0.00675	0.001	1.259259	12.59259	not relevat
397	Reflab_	CAS_206-44-0_Fluoranthene	MD-02 BS	0.087	Risky	Bad			2	0.00308	0.006	0.0435	28.24675	not relevat
416	Reflab_	EEA_32-23-5_Total Benzo(b)fluor	MD-02 BS	0.096	Risky	Bad			0.0675	0.00675	0.001	1.422222	14.22222	not relevat
3627	_MD-02	EEA_33-56-7_Total PAHs (Benzo(a	MD-02 BS	0.224	Risky	Bad			0.0675	0.00675	0.001	3.318519	33.18519	not relevat
3741	_MD-02	EEA_33-56-7_Total PAHs (Benzo(a	MD-02 BS	0.152	Risky	Bad			0.0675	0.00675	0.001	2.251852	22.51852	not relevat
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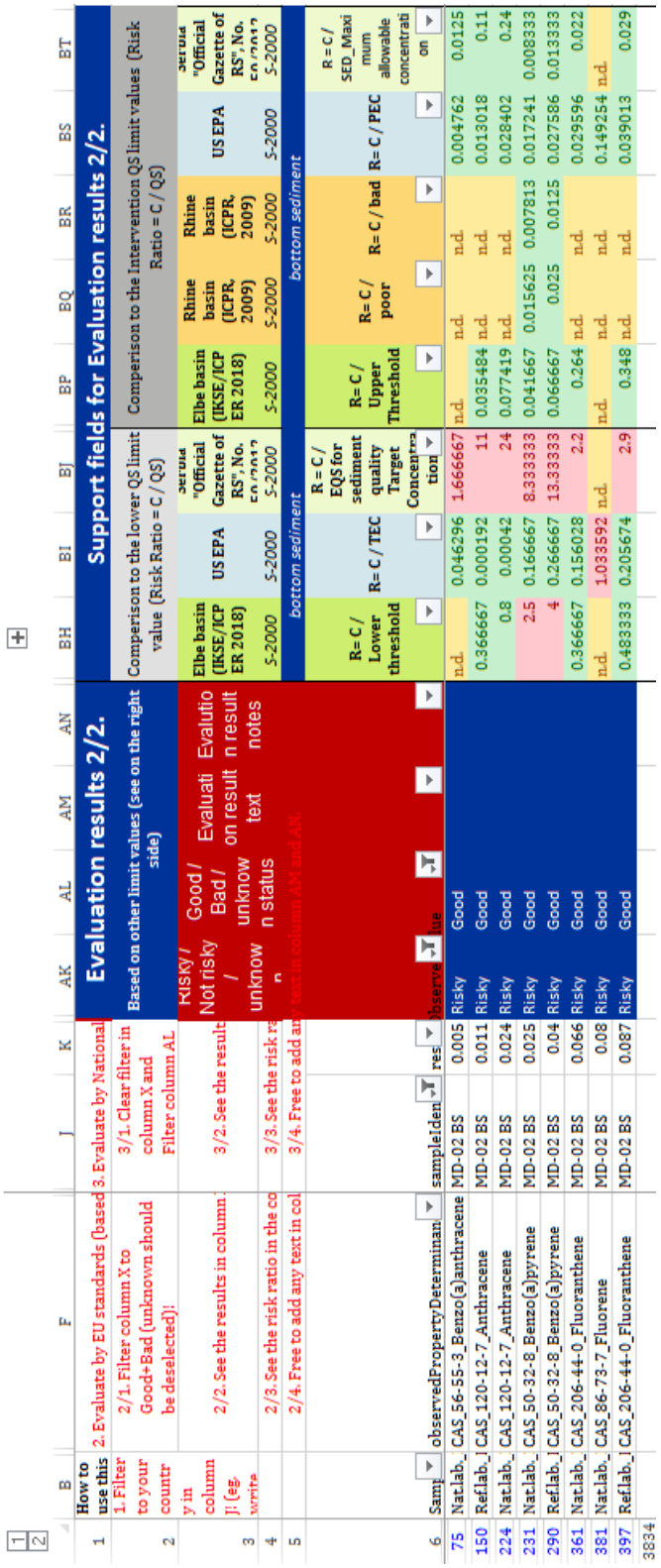
Fig. 3.7.4 Substa



	B	F	J	K	AK	AL	AM	AN	BH	BI	BJ	BP	BQ	BR	BS	BT
1	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National		Evaluation results 2/2.				Support fields for Evaluation results 2/2.							
2	1. Filter to your country in column J! (eg. write	2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL		Based on other limit values (see on the right side)				Comperison to the lower QS limit value (Risk Ratio = C / QS)			Comperison to the Intervention QS limit values (Risk Ratio = C / QS)				
3		2/2. See the results in column J	3/2. See the result		Risky / Not risky / unknown status	Good / Bad / unknown status	Evaluation result text	Evalufio n result notes	Elbe basin (IKSE/ICP ER 2018)	US EPA	Serbia "Official Gazette of RS", No. 50/2011	Elbe basin (IKSE/ICP ER 2018)	Rhine basin (ICPR, 2009)	Rhine basin (ICPR, 2009)	US EPA	Serbia "Official Gazette of RS", No. 50/2011
4		2/3. See the risk ratio in the co	3/3. See the risk re						S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000
5		2/4. Free to add any text in col	3/4. Free to add an		text in column AM and AN				bottom sediment			bottom sediment				
6	Samp	observedPropertyDeterminan	sampleIden	res	bserve	tue			R= C / Lower threshold	R= C / TEC	R= C / EQS for sediment quality Target Concentra tion	R= C / Upper Threshold	R= C / poor	R= C / bad	R= C / PEC	R= C / SED_Maxi mum allowable concentrati on
75	Natlab_	CAS_56-55-3_Benzo(a)anthracene	MD-02 BS	0.005	Risky	Good			n.d.	0.046296	1.666667	n.d.	n.d.	n.d.	0.004762	0.0125
150	Reflab_I	CAS_120-12-7_Anthracene	MD-02 BS	0.011	Risky	Good			0.366667	0.000192	11	0.035484	n.d.	n.d.	0.013018	0.11
224	Natlab_	CAS_120-12-7_Anthracene	MD-02 BS	0.024	Risky	Good			0.8	0.00042	24	0.077419	n.d.	n.d.	0.028402	0.24
231	Natlab_	CAS_50-32-8_Benzo(a)pyrene	MD-02 BS	0.025	Risky	Good			2.5	0.166667	8.333333	0.041667	0.015625	0.007813	0.017241	0.008333
290	Reflab_I	CAS_50-32-8_Benzo(a)pyrene	MD-02 BS	0.04	Risky	Good			4	0.266667	13.33333	0.066667	0.025	0.0125	0.027586	0.013333
361	Natlab_	CAS_206-44-0_Fluoranthene	MD-02 BS	0.066	Risky	Good			0.366667	0.156028	2.2	0.264	n.d.	n.d.	0.029596	0.022
381	Natlab_	CAS_86-73-7_Fluorene	MD-02 BS	0.08	Risky	Good			n.d.	1.033592	n.d.	n.d.	n.d.	n.d.	0.149254	n.d.
397	Reflab_I	CAS_206-44-0_Fluoranthene	MD-02 BS	0.087	Risky	Good			0.483333	0.205674	2.9	0.348	n.d.	n.d.	0.039013	0.029
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3.8. MONTENEGRO

ME-01 GRADAC, ĆEHOTINA RIVER

At this station for monitoring, all measured concentrations of PAHs, Pesticides and Metals in **BS** belong to the **Good** group, ie the measured values are below the permissible limits defined in the quality standard, i.e. not risky, **based on EQS dossiers** (Fig. 3.8.1).

Also, when it comes to the offered national standards, the measured concentrations of the displayed parameters are also fine, they belong to the group **Good** i.e. they are not risky (Fig. 3.8.2).

ME-01-FS-BS samples from this location are characterized by **"unknown"** ratings for the measured parameters, both for risk and quality assessment, **based on EQS dossiers**.

When it comes to evaluations based on comparisons of concentrations of individual components with national standards, sediments were rated as **Good** as a whole, almost all as **Not risky**, less often unknown, and only **CAS_7439-97-6_Mercury and its compounds** as **Risky**, due to the limit in accordance with standards **Bulgaria** (Fig. 3.8.3).

The situation is similar when it comes to the results of the analysis of **ME-01-FS-TS** samples. All samples are characterized by "**unknown**" ratings for the measured parameters, both for risk and quality assessment, **based on EQS dossiers**.

In addition to **CAS_7439-97-6_Mercury and its compounds and CAS_50-32-8_Benzo (a) pyrene** are included in the **Risky** group, also due to the limit in accordance with the standards of **Bulgaria**.

ME-02 DOBRAKOVO, LIM RIVER

At this sampling point for monitoring, all measured concentrations of PAHs, Pesticides and Metals in **BS** belong to the group **Good**, i.e., below the permitted limits in quality standards i.e. not risky, **based on EQS dossiers** (Fig. 3.8.4).

The exception is the content of **CAS_7440-02-0_Nickel and its compounds** which are higher than the limit contents in "**Elbe basin (IKSE / ICPER 2018)** " and " "**US EPA**". This is why Ni content is labeled as Risky.

Also, when national standards are offered, measurements of the concentration of available parameters are also good, they belong to the **Good** group i.e. they are not risky (Fig. 3.8.5).

ME-02-FS-BS samples are characterized by "**unknown**" ratings for the measured parameters, both for risk and quality assessment, **based on EQS dossiers**.

When it comes to evaluations based on comparisons of concentrations of individual components with national standards, sediments were rated as **Good**, almost all as **Not risky**, rarely **unknown**, and for **CAS_7439-97-6_Mercury and its compounds** and **CAS_7440-50-8_Copper and its compounds** as **Risky**, due to limit in accordance with standards: **Dutch pollution list; Bulgaria and Serbia "Official Gazette of RS", No. 30/2018 and 64/2019** (Fig. 3.8.6).

The situation is similar when it comes to the results of the analysis of ME-02-FS-TS samples. All samples are characterized by "**unknown**" ratings for the measured parameters, both for risk and quality assessment, **based on EQS dossiers**.

In addition to **CAS_7439-97-6_Mercury and its compounds** and **CAS_7440-50-8_Copper and its compounds** and **CAS_7440-38-2_Arsenic and its compounds** belong to the **Risky** group, also due to the limit in accordance with the standards: Dutch pollution list; Bulgaria and Serbia "Official Gazette of RS", No. 30/2018 and 64/2019.

	B	F	J	K	W	X	Y	Z	AC	AD	AE	AH	AI	AJ
1	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National		Evaluation results 1/2. Based on EQS dossiers				Support fields for Evaluation results 1/2. QS values based on EQS dossiers			Comparisson to QS value based on EQS dossiers (Risk Ratio = C / QS)		
2	1. Filter to your countr y in column J! (eg. write	2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL		Risky / Not risky / unknow n	Good / Bad / unkn own	Evaluati on result text	Evalutio n result notes	2) CHS in <63um = CHS in <2mm S-2000	S-2000	W-SPM	2) CHS in <63um = CHS in <2mm S-2000	S-2000	W-SPM
3		2/2. See the results in column	3/2. See the results						QS benthic, freshwate r	EQSsed.	EQSsus p.	R = C / QS benthic, freshwate r	R = C / EQSsed.	R = C / EQSsusp.
4		2/3. See the risk ratio in the co	3/3. See the risk re						0.0675	0.00675	0.001	0.037037	0.37037	not relevan
5		2/4. Free to add any text in col	3/4. Free to add an						0.042	0.042	0.073	0.059524	0.059524	not relevan
6	Samp	observedPropertyDeterminan	sampleIden	res	bserve	lue			2	0.00308	0.006	0.00125	LOQ>limit	not relevan
1892	Natlab_	CAS_7440-02-0_Nickel and its com	ME-01 BS	20	Not risky	Good			0.138	0	0	0.018116	n.d.	not relevan
1960	Natlab_	CAS_7439-92-1_Lead and its comp	ME-01 BS	8.1	Not risky	Good			0.0103	0.0103	0.011	0.024272	0.024272	not relevan
2213	Natlab_	CAS_608-73-1_Hexachlorocyclohe	ME-01 BS	5E-04	Not risky	Good			0.000015	1.05E-07	3E-06	0	0	not relevan
2849	Natlab_	CAS_120-12-7_Anthracene	ME-01 BS	0.005	Not risky	Good			0.0675	0.00675	0.001	0	0	not relevan
2851	Natlab_	CAS_50-32-8_Benzo(a)pyrene	ME-01 BS	0.005	Not risky	Good			0.0103	0.0103	0.011	0	0	not relevan
2852	Natlab_	EEA_32-23-5_Total Benzo(b)fluor	ME-01 BS	0.005	Not risky	Good			0.0675	0.00675	0.001	0	0	not relevan
2853	Natlab_	CAS_191-24-2_Benzo(g,h,i)perylen	ME-01 BS	0.005	Not risky	Good			0.0103	0.0103	0.011	0	0	not relevan
2856	Natlab_	CAS_206-44-0_Fluoranthene	ME-01 BS	0.005	Not risky	Good			0.0675	0.00675	0.001	0	0	not relevan
2859	Natlab_	CAS_91-20-3_Naphthalene	ME-01 BS	0.005	Not risky	Good			0.0103	0.0103	0.011	0	0	not relevan
3284	Natlab_	CAS_608-73-1_Hexachlorocyclohe	ME-01 BS	5E-04	Not risky	Good			0.0675	0.00675	0.001	0.037037	0.37037	not relevan
3399	Reflab_	EEA_33-50-1_Heptachlor and hept	ME-01 BS	0	Not risky	Good								
3628	_ME-01	EEA_33-56-7_Total PAHs (Benzo(g	ME-01 BS	0	Not risky	Good								
3714	Reflab_	CAS_608-73-1_Hexachlorocyclohe	ME-01 BS	0	Not risky	Good								
3742	_ME-01	EEA_33-56-7_Total PAHs (Benzo(g	ME-01 BS	0.005	Not risky	Good								
3834														

	B	F	J	K	AK	AL	AM	AN	BH	BI	BJ	BP	BQ	BR	BS	BT
1	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National		Evaluation results 2/2.				Support fields for Evaluation results 2/2.							
2	1. Filter to your country in column J! (eg. write	2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL		Based on other limit values (see on the right side)				Comparison to the lower QS limit value (Risk Ratio = C / QS)			Comparison to the Intervention QS limit values (Risk Ratio = C / QS)				
3		2/2. See the results in column	3/2. See the result		Risky / Not risky / unknown	Good / Bad / unknown status	Evaluation result text	Evaluation result notes	Elbe basin (IKSE/ICPER 2018)	US EPA	German "Official Gazette of RS", No. 50/2017	Elbe basin (IKSE/ICPER 2018)	Rhine basin (ICPR, 2009)	Rhine basin (ICPR, 2009)	US EPA	German "Official Gazette of RS", No. 50/2017
4		2/3. See the risk ratio in the co	3/3. See the risk ra						S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000
5		2/4. Free to add any text in col	3/4. Free to add any text in column AM and AN.						bottom sediment			bottom sediment				
6	Sam	observedPropertyDeterminand	sampleIden	res	Observe				R = C / Lower threshold	R = C / TEC	R = C / EQS for sediment quality Target Concentration	R = C / Upper Threshold	R = C / poor	R = C / bad	R = C / PEC	R = C / SED_Maximum allowable concentration
1808	Natlab_	CAS_85-01-8_Phenanthrene	ME-01 BS	0.007	Not risky	Good			n.d.	0.034314	n.d.	n.d.	n.d.	n.d.	0.005983	n.d.
1851	Natlab_	CAS_7439-97-6_Mercury and its co	ME-01 BS	0.063	Not risky	Good			0.42	0.35	0.21	0.134043	0.0315	0.01575	0.059434	0.039375
1887	Natlab_	CAS_7440-47-3_Chromium and its	ME-01 BS	15	Not risky	Good			0.576923	0.345622	0.15	0.023438	n.d.	n.d.	0.135135	0.0625
1892	Natlab_	CAS_7440-02-0_Nickel and its com	ME-01 BS	20	Risky	Good			6.666667	0.881057	0.571429	0.377358	0.1	0.05	0.411523	0.454545
1899	Natlab_	CAS_7440-50-8_Copper and its cor	ME-01 BS	25	Risky	Good			1.785714	0.791139	0.694444	0.15625	0.125	0.0625	0.167785	0.227273
1903	Natlab_	CAS_7440-38-2_Arsenic and its cor	ME-01 BS	3.1	Not risky	Good			0.392405	0.31665	0.106897	0.0775	n.d.	n.d.	0.093939	0.07381
1910	Natlab_	CAS_7440-66-6_Zinc and its compo	ME-01 BS	39	Not risky	Good			0.195	0.322314	0.278571	0.04875	0.04875	0.024375	0.084967	0.090698
1960	Natlab_	CAS_7439-92-1_Lead and its comp	ME-01 BS	8.1	Not risky	Good			0.324	0.226257	0.095294	0.15283	0.02025	0.010125	0.063281	0.026129
2199	Natlab_	CAS_76-44-8_Heptachlor	ME-01 BS	5E-04	Not risky	Good			n.d.	n.d.	0.000357	n.d.	n.d.	n.d.	n.d.	3.68E-06
2206	Natlab_	CAS_1024-57-3_Heptachlor epoxic	ME-01 BS	5E-04	Not risky	Good			n.d.	0.101215	LOQ>limit	n.d.	n.d.	n.d.	0.015625	0.125
2213	Natlab_	CAS_608-73-1_Hexachlorocyclohe	ME-01 BS	5E-04	Not risky	Good			LOQ>limit	0.105485	0.000025	0.166667	n.d.	n.d.	0.0501	#VALUE!
2220	Natlab_	CAS_118-74-1_Hexachlorobenzene	ME-01 BS	5E-04	unknown	Good			LOQ>limit	n.d.	n.d.	0.014706	0.001563	#VALUE!	n.d.	n.d.
2849	Natlab_	CAS_120-12-7_Anthracene	ME-01 BS	0.005	Not risky	Good			0.083333	4.37E-05	LOQ>limit	0.008065	n.d.	n.d.	0.002959	0.025
2850	Natlab_	CAS_56-55-3_Benzo(a)anthracene	ME-01 BS	0.005	Not risky	Good			n.d.	0.023148	LOQ>limit	n.d.	n.d.	n.d.	0.002381	0.00625
2851	Natlab_	CAS_50-32-8_Benzo(a)pyrene	ME-01 BS	0.005	Not risky	Good			0.25	0.016667	LOQ>limit	0.004167	0.001563	0.000781	0.001724	0.000833
2853	Natlab_	CAS_191-24-2_Benzo(g,h,i)perylen	ME-01 BS	0.005	Not risky	Good			n.d.	n.d.	0.03125	n.d.	n.d.	n.d.	n.d.	0.000313
2854	Natlab_	CAS_218-01-9_Chrysene	ME-01 BS	0.005	Not risky	Good			n.d.	0.01506	n.d.	n.d.	n.d.	n.d.	0.001938	n.d.
2856	Natlab_	CAS_206-44-0_Fluoranthene	ME-01 BS	0.005	Not risky	Good			0.013889	0.00591	0.083333	0.01	n.d.	n.d.	0.001121	0.000833
2857	Natlab_	CAS_86-73-7_Fluorene	ME-01 BS	0.005	Not risky	Good			n.d.	0.0323	n.d.	n.d.	n.d.	n.d.	0.004664	n.d.
2858	Natlab_	CAS_193-39-5_Indeno(1,2,3-cd)pyr	ME-01 BS	0.005	Not risky	Good			n.d.	n.d.	0.041667	n.d.	n.d.	n.d.	n.d.	0.000417
2859	Natlab_	CAS_91-20-3_Naphthalene	ME-01 BS	0.005	Not risky	Good			n.d.	0.014205	LOQ>limit	n.d.	n.d.	n.d.	0.004456	0.025
2860	Natlab_	CAS_129-00-0_Pyrene	ME-01 BS	0.005	Not risky	Good			n.d.	0.012821	n.d.	n.d.	n.d.	n.d.	0.001645	n.d.
2939	Natlab_	CAS_7440-43-9_Cadmium and its c	ME-01 BS	0.2	Not risky	Good			0.454545	0.10101	0.125	0.043478	0.025	0.0125	0.02008	0.015625
3284	Natlab_	CAS_608-73-1_Hexachlorocyclohe	ME-01 BS	5E-04	Not risky	Good			LOQ>limit	0.105485	0.000025	0.166667	n.d.	n.d.	0.0501	#VALUE!
3399	Reflab_	EEA_33-50-1_Heptachlor and hept	ME-01 BS	0	Not risky	Good			n.d.	0	n.d.	n.d.	n.d.	n.d.	0	n.d.
3513	Natlab_	EEA_33-50-1_Heptachlor and hept	ME-01 BS	5E-04	Not risky	Good			n.d.	0.101215	n.d.	n.d.	n.d.	n.d.	0.015625	n.d.
3628	_ME-01	EEA_33-56-7_Total PAHs (Benzo(a	ME-01 BS	0	Not risky	Good			0	0	0	0	n.d.	n.d.	0	0
3714	Reflab_	CAS_608-73-1_Hexachlorocyclohe	ME-01 BS	0	Not risky	Good			0	0	0	0	n.d.	n.d.	0	#VALUE!
3742	_ME-01	EEA_33-56-7_Total PAHs (Benzo(a	ME-01 BS	0.005	Not risky	Good			0.004167	0.001553	0.0025	0.001	n.d.	n.d.	0.00011	0.00025
3834																

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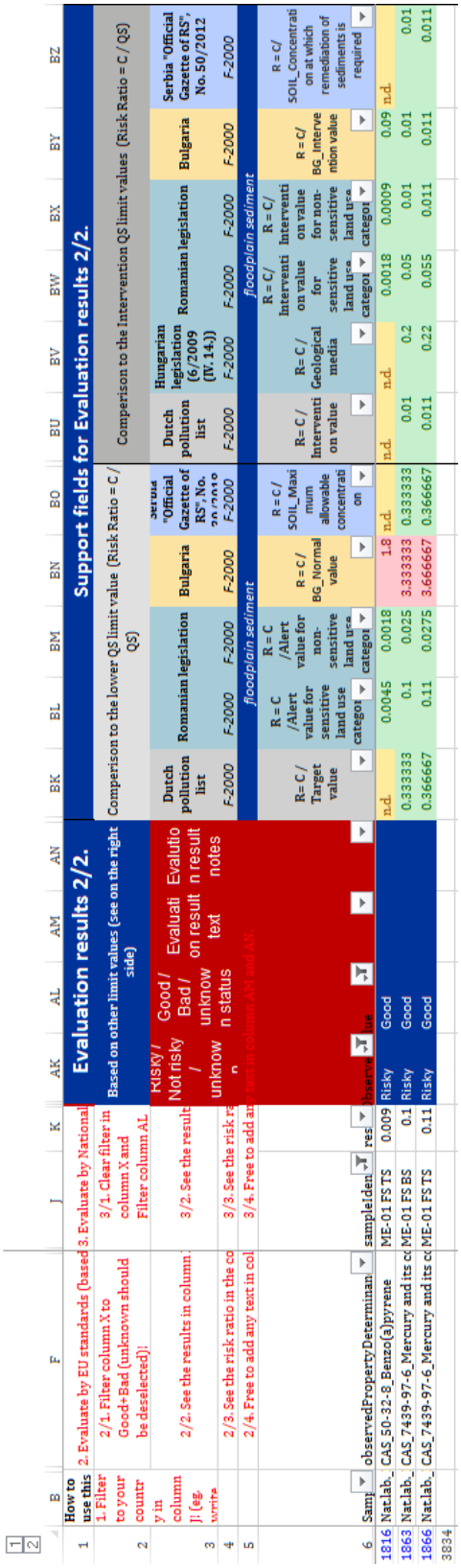

	B	F	J	K	AK	AL	AM	AN	BK	BL	BM	BN	BO	BU	BV	BW	BX	BY	BZ
1	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National		Evaluation results 2/2.				Support fields for Evaluation results 2/2.										
	1. Filter to your country in column J! (eg. Serbia)	2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL		Based on other limit values (see on the right side)				Comperison to the lower QS limit value (Risk Ratio = C / QS)					Comperison to the Intervention QS limit values (Risk Ratio = C / QS)					
		2/2. See the results in column AL!	3/2. See the result		Risky / Not risky / unknown	Good / Bad / unknown status	Evaluation result text	Evalution result notes	Dutch pollution list	Romanian legislation	Bulgaria		"Official Gazette of RS", No. 30/2010	Dutch pollution list	Hungarian legislation (6/2009 (IV.14.))	Romanian legislation	Bulgaria	Serbia "Official Gazette of RS", No.50/2012
		2/3. See the risk ratio in the co	3/3. See the risk re						F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000
		2/4. Free to add any text in col	3/4. Free to add any		text in column AN!				floodplain sediment									
6	Sampl	observedPropertyDeterminan	sampleiden	res	observe	value			R= C / Target value	R = C /Alert value for sensitive land use categori	R = C /Alert value for non-sensitive land use categori	R = C / BG_Normal value	R = C / SOIL_Maximum allowable concentration	R= C / Intervention value	R= C / Geological media	R = C/ Intervention value for sensitive land use categori	R = C/ Intervention value for non-sensitive land use categori	R = C/ BG_Intervention value	R = C/ SOIL_Concentration at which remediation of sediments is required
1816	Natlab_	CAS_50-32-8_Benzo(a)pyrene	ME-01 FS TS	0.009	Risky	Good			n.d.	0.0045	0.0018	1.8	n.d.	n.d.	n.d.	0.0018	0.0009	0.09	n.d.
1863	Natlab_	CAS_7439-97-6_Mercury and its co	ME-01 FS BS	0.1	Risky	Good			0.333333	0.1	0.025	3.333333	0.333333	0.01	0.2	0.05	0.01	0.01	0.01
1866	Natlab_	CAS_7439-97-6_Mercury and its co	ME-01 FS TS	0.11	Risky	Good			0.366667	0.11	0.0275	3.666667	0.366667	0.011	0.22	0.055	0.011	0.011	0.011
3834																			

Fig. 3.8.3 Montenegro (flood plain sediments)

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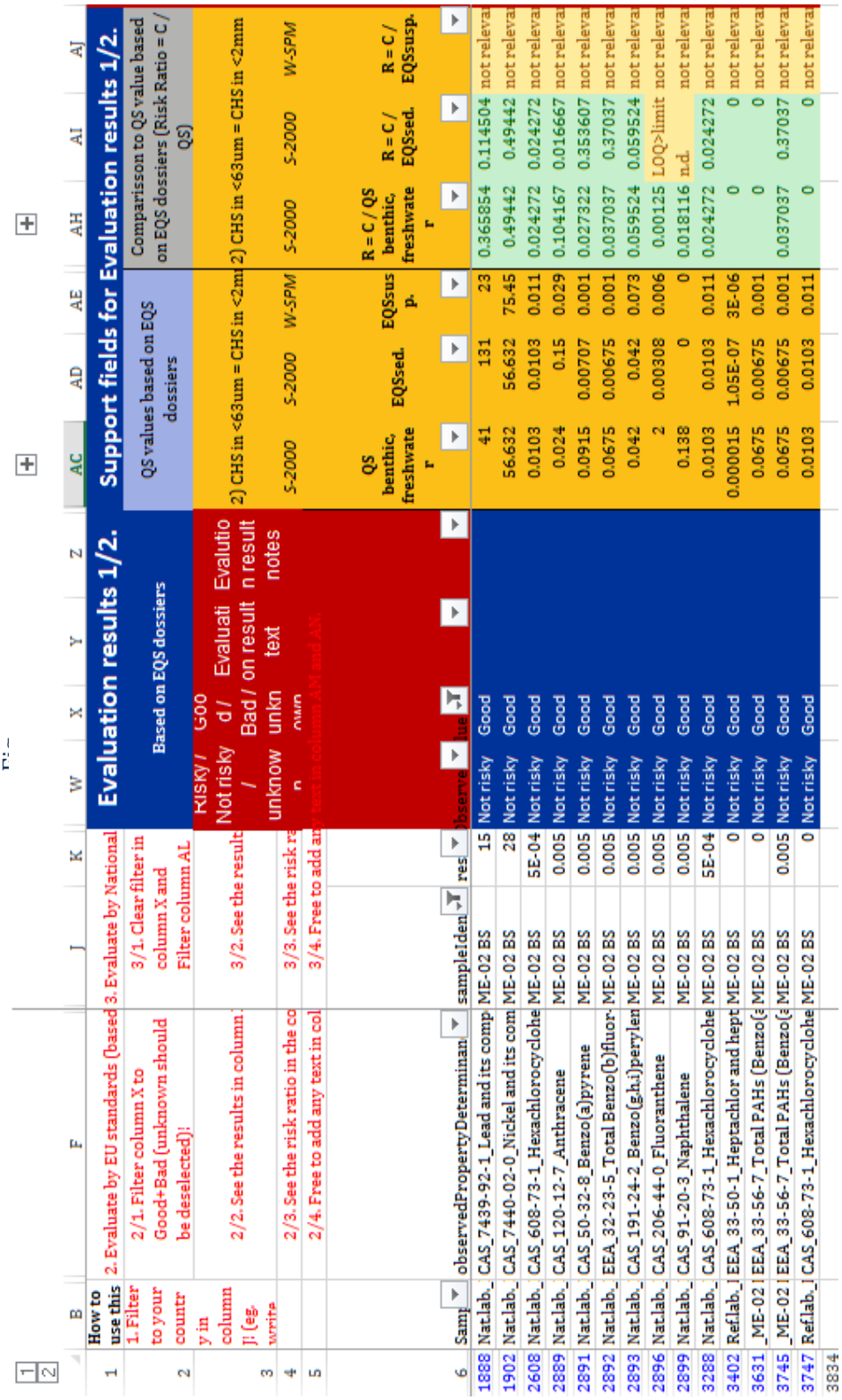

	B	F	J	K	W	X	Y	Z	AC	AD	AE	AH	AI	AJ
	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National		Evaluation results 1/2. Based on EQS dossiers				Support fields for Evaluation results 1/2. QS values based on EQS dossiers			Comparisson to QS value based on EQS dossiers (Risk Ratio = C / QS)		
1	1. Filter	2/1. Filter column X to	3/1. Clear filter in											
2	to your countr	Good+Bad (unknown should	column X and											
	y in column J! (eg. write	be deselected)!	Filter column AL											
3		2/2. See the results in column	3/2. See the results		Risky / Not risky / unknown	Good / Bad / unkn own	Evaluation result text	Evalution result notes	2) CHS in <63um = CHS in <2mm			2) CHS in <63um = CHS in <2mm		
4		2/3. See the risk ratio in the co	3/3. See the risk ra						S-2000	S-2000	W-SPM	S-2000	S-2000	W-SPM
5		2/4. Free to add any text in col	3/4. Free to add any text in column AM and AN.						QS benthic, freshwater	EQSsed.	EQSsusp.	R = C / QS benthic, freshwater	R = C / EQSsed.	R = C / EQSsusp.
6	Samp	observedPropertyDeterminan	sampleIden	res	Observe	lue								
1888	Natlab_	CAS_7439-92-1_Lead and its comp	ME-02 BS	15	Not risky	Good			41	131	23	0.365854	0.114504	not relevar
1902	Natlab_	CAS_7440-02-0_Nickel and its com	ME-02 BS	28	Not risky	Good			56.632	56.632	75.45	0.49442	0.49442	not relevar
2608	Natlab_	CAS_608-73-1_Hexachlorocyclohe	ME-02 BS	5E-04	Not risky	Good			0.0103	0.0103	0.011	0.024272	0.024272	not relevar
2889	Natlab_	CAS_120-12-7_Anthracene	ME-02 BS	0.005	Not risky	Good			0.024	0.15	0.029	0.104167	0.016667	not relevar
2891	Natlab_	CAS_50-32-8_Benzo(a)pyrene	ME-02 BS	0.005	Not risky	Good			0.0915	0.00707	0.001	0.027322	0.353607	not relevar
2892	Natlab_	EEA_32-23-5_Total Benzo(b)fluor	ME-02 BS	0.005	Not risky	Good			0.0675	0.00675	0.001	0.037037	0.37037	not relevar
2893	Natlab_	CAS_191-24-2_Benzo(g,h,i)peryler	ME-02 BS	0.005	Not risky	Good			0.042	0.042	0.073	0.059524	0.059524	not relevar
2896	Natlab_	CAS_206-44-0_Fluoranthene	ME-02 BS	0.005	Not risky	Good			2	0.00308	0.006	0.00125	LOQ>limit	not relevar
2899	Natlab_	CAS_91-20-3_Naphthalene	ME-02 BS	0.005	Not risky	Good			0.138	0	0	0.018116	n.d.	not relevar
3288	Natlab_	CAS_608-73-1_Hexachlorocyclohe	ME-02 BS	5E-04	Not risky	Good			0.0103	0.0103	0.011	0.024272	0.024272	not relevar
3402	Reflab_	EEA_33-50-1_Heptachlor and hept	ME-02 BS	0	Not risky	Good			0.000015	1.05E-07	3E-06	0	0	not relevar
3631	_ME-02	EEA_33-56-7_Total PAHs (Benzo(	ME-02 BS	0	Not risky	Good			0.0675	0.00675	0.001	0	0	not relevar
3745	_ME-02	EEA_33-56-7_Total PAHs (Benzo(	ME-02 BS	0.005	Not risky	Good			0.0675	0.00675	0.001	0.037037	0.37037	not relevar
3747	Reflab_	CAS_608-73-1_Hexachlorocyclohe	ME-02 BS	0	Not risky	Good			0.0103	0.0103	0.011	0	0	not relevar
3834														

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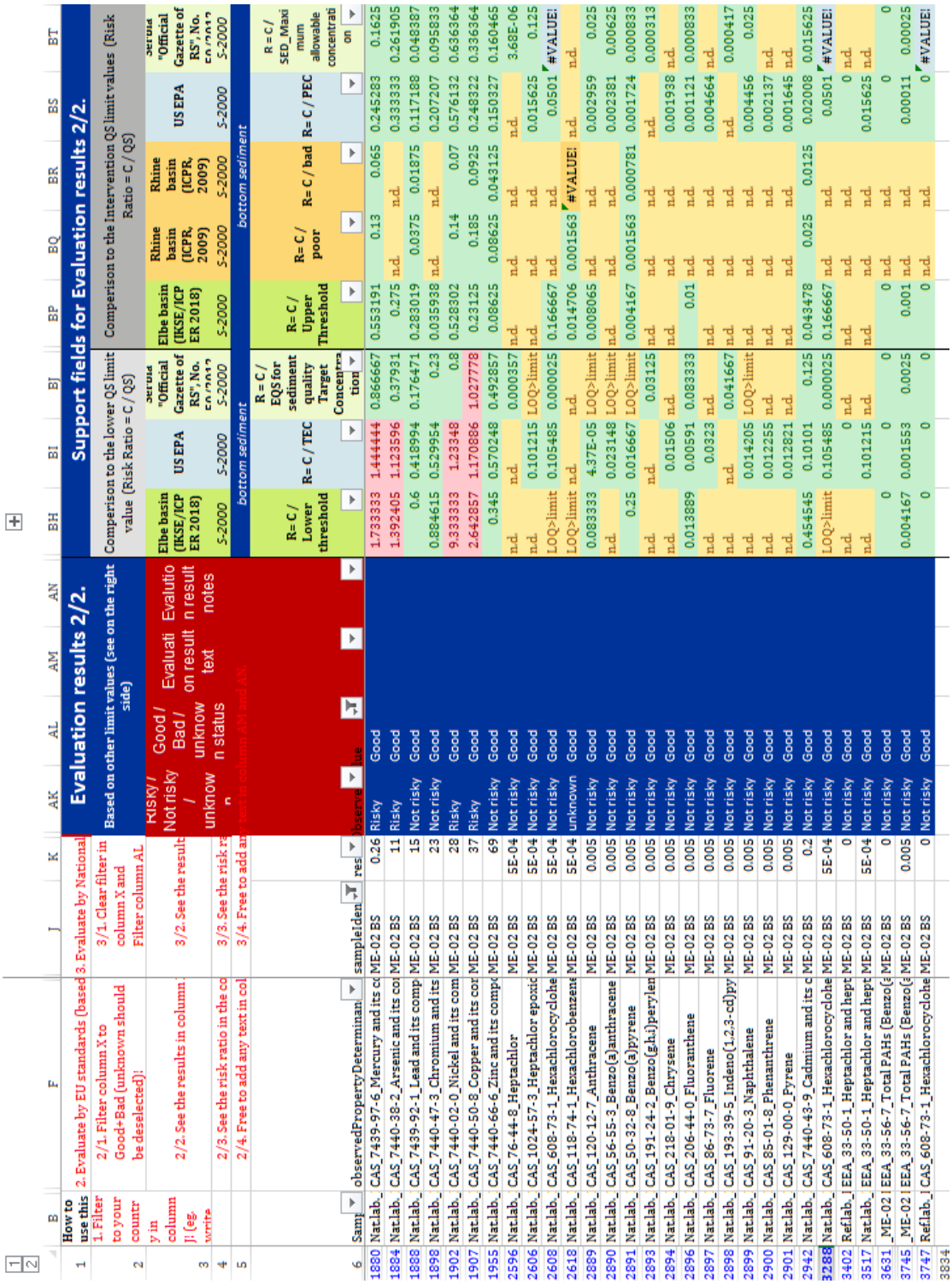
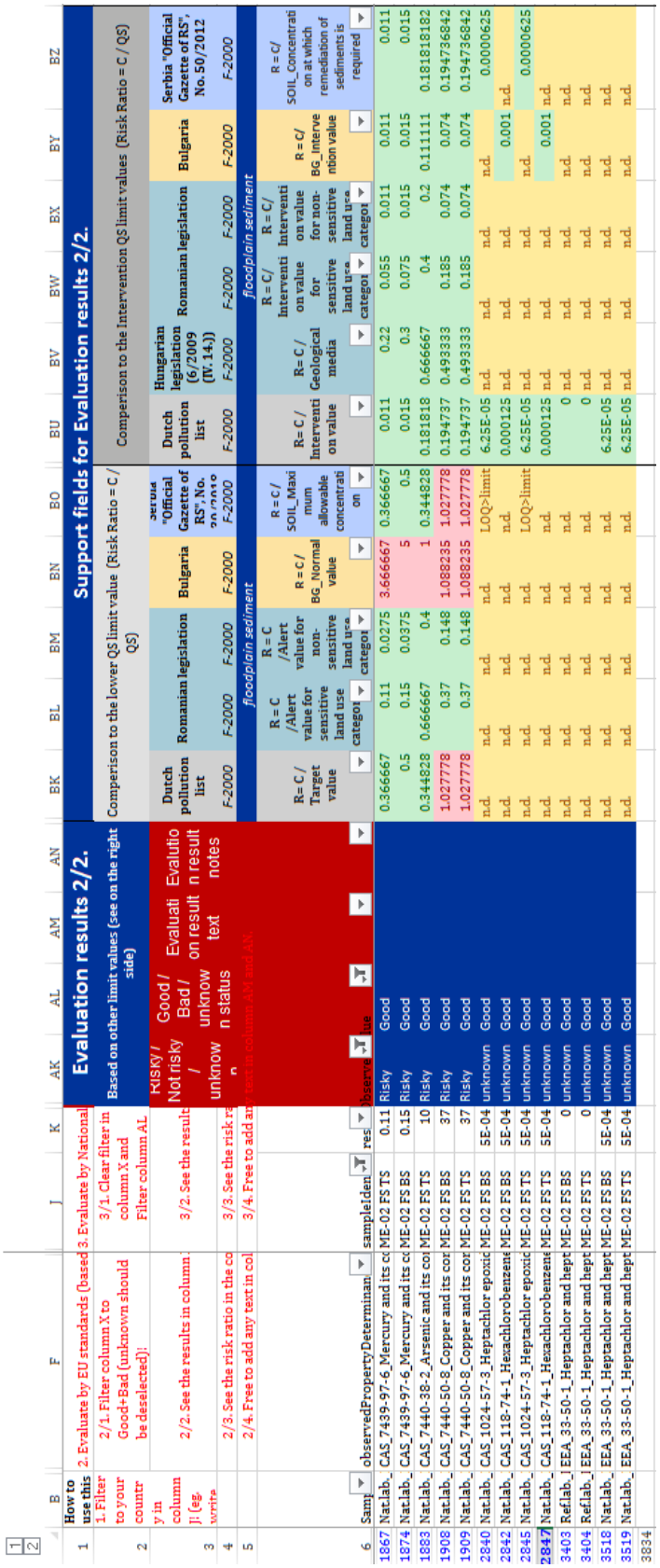
Fig. 3.8.5 Substances above the national



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

Fig. 3.8.6 Substances above the national standards in the baseline



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

3.9. ROMANIA

RO-01 Danube River at Bazias

EU standards (EQS dossier)

Bottom sediments

As regards metals, only Lead and Nickel in the sample RO-01-BS-R (50 m away from the right side of Danube) have higher content both in the reference laboratory and national laboratory data, meaning risk ratios higher than 1 (Fig. 3.9.1)

Regarding PAHs, Anthracene was found with risk ratio of 1.08 only in the river center (RO-01-BS-C) in the measurement of the reference laboratory.

Fluoranthene occurs in all three parts of the profile (L, C, R) as revealed by both reference and national laboratory, the risk ratio varying between 6.49 and 40.25.

The reference and national laboratories showed that Benzo(a)pyrene occurs also in all three parts of the profile, the risk ratio being between 1.27 and 6.79.

For all parts of the profile the risk ratio for Benzo(b)fluoranthene, measured by national laboratory, showed values between 1.41 and 9.05 and for Benzo(k)fluoranthene it varies between 2.2 and 2.81. After the reference laboratory, total Benzo(b)fluoranthene + Benzo(k)fluoranthene varies between 7.70 and 14.52.

Total PAHs are high according to both laboratories for all three points of the profile. The risk ratio is between 1.48 and 27.45.

Suspended sediments

For suspended sediment samples, Lead had a risk ratio of 1.56 for RO-01-SS-R and 2.09 for RO-01-SS-C, based on EQS dossier. Nickel content in RO-01-SS-C is 76.1 ppm and the risk ratio is 1.01. Other metals do not show higher risk ratio than 1 (Fig. 3.9.2).

National standards

Bottom sediments

The bottom sediments at Bazias on the right side of the profile (RO-01-BS-R), according to national standards, show “risky” and “bad” status for Nickel (both in national and reference laboratory) and Chromium (reference laboratory). In Fig. 3.9.3 it can be seen that the risk ratio for bottom sediments is above the l**ower** QS limit value (columns BH, BI, BJ in the above-mentioned figure), and regarding Nickel is above the **intervention** QS limit values for Elbe basin, US EPA and Serbia “Official Gazette of RS” (columns BP, BS and BT). The risk ratio for **intervention** QS limit is between 1.66 and 2.17. Chromium is also above the **intervention** QS limit, according to US EPA, with the risk ratio of 1.11.

As concerns the status "risky" and "good" (Fig. 3.9.4), this is the case of some bottom sediments in the left, center and right bank of the Danube for the following substances: Anthracene, Benzo(a)pyrene, Fluoranthene, Mercury, Cadmium, Arsenic, Copper, Chromium, Nickel, Lead and Zinc and their compounds. These substances are above the **lower** QS limit in one or two or three national standards (Elbe lower threshold, US EPA, Serbia "Official Gazette of RS"). The highest risk ratio values, between 10.23 and 13.37, were found for Nickel, compared to Elbe lower threshold. The above-mentioned substances are below the intervention QS limit values (columns BP, BQ, BS and BT).

All the other substances have the status "not risky" and "good" (e.g. Total PAHs, Heptachlor etc.).

Floodplain sediments

Floodplain sediments at Bazias (RO-01) were sampled on the left bank of the Danube River. Their status is "good", but "risky" for Copper (national laboratory – both for top soil TS and bottom soil BS) according to the lower QS limit values of Dutch target value, Serbia "Official Gazette of RS" and Bulgarian soil normal values. The risk ratio is between 1.02 and 1.21 (Fig. 3.9.5). Nickel appears also in bottom soil with a risk ratio value of 1, according to Dutch target value and Serbia "Official Gazette of RS".

Conclusions for Bazias baseline station

The risk ratios for Lead and its compounds in bottom and suspended sediment samples are a result of mining activities in the catchment area and may also be due to naval traffic.

The higher content of Nickel in bottom sediments probably reflects the geological background, because the Danube crosses the complex of basic igneous rocks.

The copper as weak pollutant in floodplain sediments is coming from human activities and natural sources (dust spread by the wind from base metal deposits excavated in large quarries) is less harmful to the environment. Copper can be also released from manufacturing various products containing it (metal, electrical, pesticides, fungicides). Prescribed limit for Cu in drinking water is less than 0.05 mg/l, according to WHO and ISI norms.

PAHs, generated at high temperature and low oxygen level, by fuel and wood combustion in industrial processes and in urban areas, as well as from various transport activities, resulting petroleum residues, show low water solubility, high resistance to oxidation and reduction, are present as as particulate matter showing high mobility in any environment (air, soil, water). PAHs adhere to atmospheric particles with which are settling on soil, surface waters as streams and lakes, then dispersed by currents, and embedded in sediments or kept in suspension.

Due to their persistence in the environment, PAHs have moderate to high toxicity for aquatic organisms (fish and molluscs), birds and plants, as a result of their capability to bioaccumulate and to react with cellular proteins and DNA causing genetic mutations, malformation, tumors and cancer (Canadian Council of Ministers of the Environment, 2010; Shafy et Mansour, 2016). PAHs are more toxic in the presence of UV radiation. Absorbing PAHs by dermal contact is facilitated by their lipophyllic character.

The high values of PAHs in RO samples can be attributed to agricultural activities, navigation activity on Danube, waste discharge from chemical and pharmaceutical industries carried by effluent sources.

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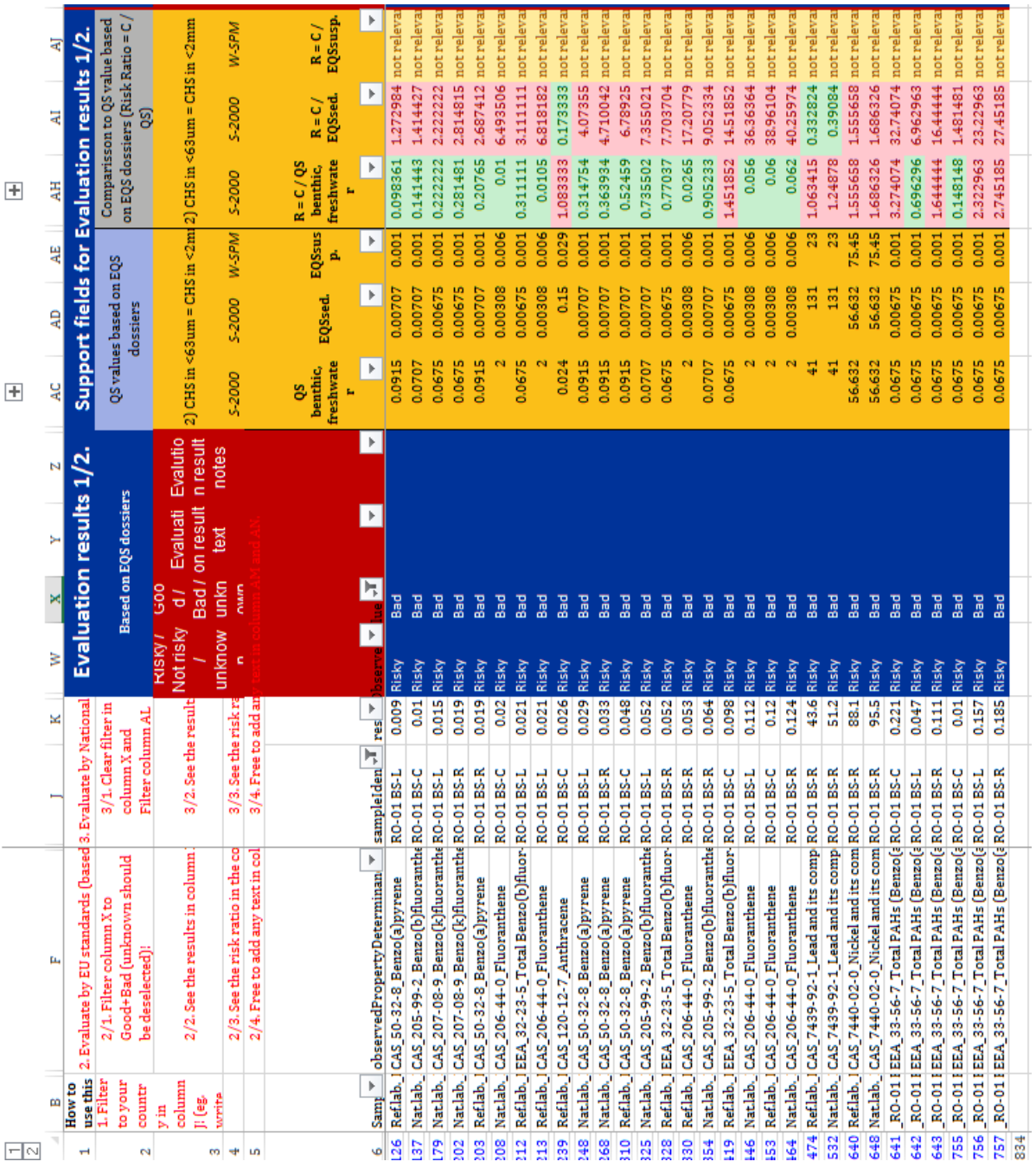
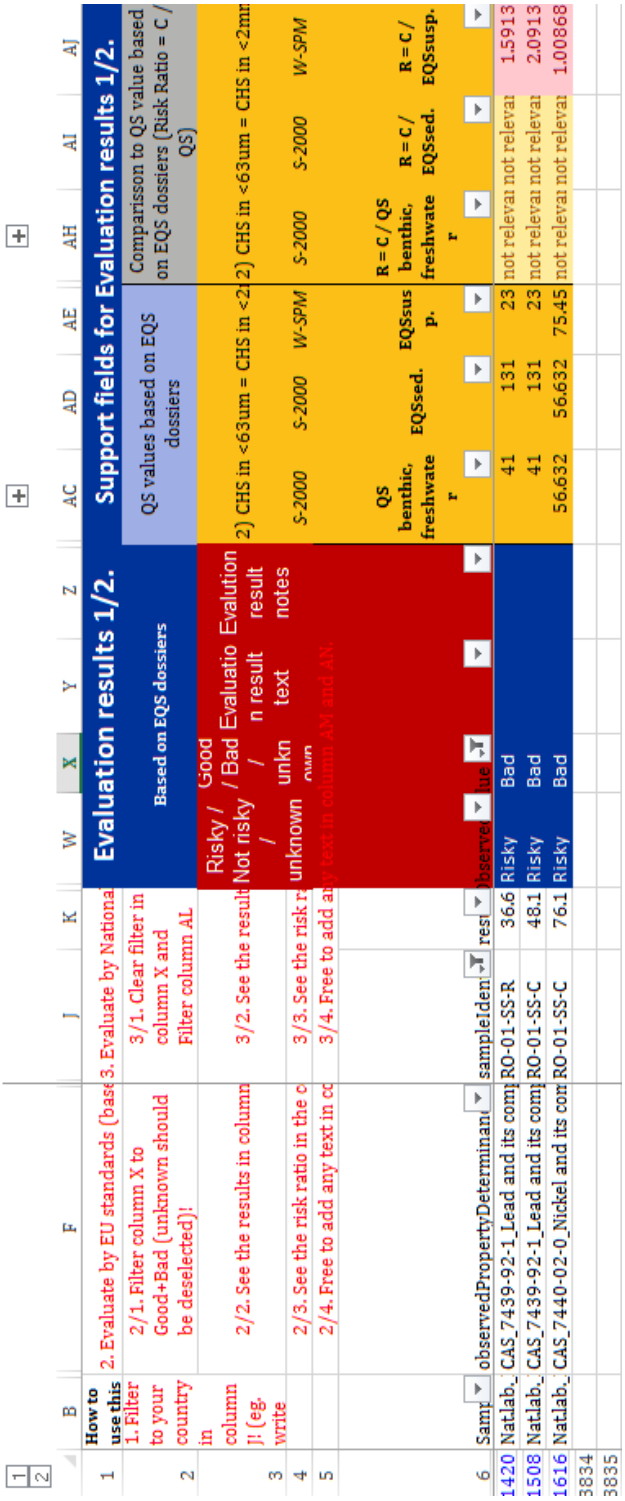
Fig. 3 9 1



	B	F	J	K	W	X	Y	Z	AC	AD	AE	AH	AI	AJ
1	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National		Evaluation results 1/2. Based on EQS dossiers				Support fields for Evaluation results 1/2. QS values based on EQS dossiers			Comparisson to QS value based on EQS dossiers (Risk Ratio = C / QS)		
2	1. Filter to your country in column J! (eg. write	2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL											
3		2/2. See the results in column	3/2. See the results		Risky / Not risky / unknown	Good / Bad / unkn own	Evaluation result text	Evalution result notes	2) CHS in <63um = CHS in <2mm S-2000	2) CHS in <63um = CHS in <2mm S-2000	W-SPM	2) CHS in <63um = CHS in <2mm S-2000	2) CHS in <63um = CHS in <2mm S-2000	W-SPM
4		2/3. See the risk ratio in the co	3/3. See the risk ra						QS benthic, freshwater	EQSsed.	EQSsusp.	R = C / QS benthic, freshwater	R = C / EQSsed.	R = C / EQSsusp.
5		2/4. Free to add any text in col	3/4. Free to add an				text in column AM and AN.							
6	Sam	observedPropertyDeterminan	sampleIden	res	observe	lue								
126	Reflab_J	CAS_50-32-8_Benzo(a)pyrene	RO-01 BS-L	0.009	Risky	Bad			0.0915	0.00707	0.001	0.098361	1.272984	not relevar
137	Natlab_	CAS_205-99-2_Benzo(b)fluoranthe	RO-01 BS-C	0.01	Risky	Bad			0.0707	0.00707	0.001	0.141443	1.414427	not relevar
179	Natlab_	CAS_207-08-9_Benzo(k)fluoranthe	RO-01 BS-L	0.015	Risky	Bad			0.0675	0.00675	0.001	0.222222	2.222222	not relevar
202	Natlab_	CAS_207-08-9_Benzo(k)fluoranthe	RO-01 BS-R	0.019	Risky	Bad			0.0675	0.00675	0.001	0.281481	2.814815	not relevar
203	Reflab_J	CAS_50-32-8_Benzo(a)pyrene	RO-01 BS-R	0.019	Risky	Bad			0.0915	0.00707	0.001	0.20765	2.687412	not relevar
208	Natlab_	CAS_206-44-0_Fluoranthene	RO-01 BS-C	0.02	Risky	Bad			2	0.00308	0.006	0.01	6.493506	not relevar
212	Reflab_J	EEA_32-23-5_Total Benzo(b)fluor	RO-01 BS-L	0.021	Risky	Bad			0.0675	0.00675	0.001	0.311111	3.111111	not relevar
213	Reflab_J	CAS_206-44-0_Fluoranthene	RO-01 BS-L	0.021	Risky	Bad			2	0.00308	0.006	0.0105	6.818182	not relevar
239	Reflab_J	CAS_120-12-7_Anthracene	RO-01 BS-C	0.026	Risky	Bad			0.024	0.15	0.029	1.083333	0.173333	not relevar
248	Natlab_	CAS_50-32-8_Benzo(a)pyrene	RO-01 BS-L	0.029	Risky	Bad			0.0915	0.00707	0.001	0.314754	4.07355	not relevar
268	Natlab_	CAS_50-32-8_Benzo(a)pyrene	RO-01 BS-R	0.033	Risky	Bad			0.0915	0.00707	0.001	0.363934	4.710042	not relevar
310	Reflab_J	CAS_50-32-8_Benzo(a)pyrene	RO-01 BS-C	0.048	Risky	Bad			0.0915	0.00707	0.001	0.52459	6.78925	not relevar
325	Natlab_	CAS_205-99-2_Benzo(b)fluoranthe	RO-01 BS-L	0.052	Risky	Bad			0.0707	0.00707	0.001	0.735502	7.355021	not relevar
328	Reflab_J	EEA_32-23-5_Total Benzo(b)fluor	RO-01 BS-R	0.052	Risky	Bad			0.0675	0.00675	0.001	0.77037	7.703704	not relevar
330	Reflab_J	CAS_206-44-0_Fluoranthene	RO-01 BS-R	0.053	Risky	Bad			2	0.00308	0.006	0.0265	17.20779	not relevar
354	Natlab_	CAS_205-99-2_Benzo(b)fluoranthe	RO-01 BS-R	0.064	Risky	Bad			0.0707	0.00707	0.001	0.905233	9.052334	not relevar
419	Reflab_J	EEA_32-23-5_Total Benzo(b)fluor	RO-01 BS-C	0.098	Risky	Bad			0.0675	0.00675	0.001	1.451852	14.51852	not relevar
446	Natlab_	CAS_206-44-0_Fluoranthene	RO-01 BS-L	0.112	Risky	Bad			2	0.00308	0.006	0.056	36.36364	not relevar
453	Reflab_J	CAS_206-44-0_Fluoranthene	RO-01 BS-C	0.12	Risky	Bad			2	0.00308	0.006	0.06	38.96104	not relevar
464	Natlab_	CAS_206-44-0_Fluoranthene	RO-01 BS-R	0.124	Risky	Bad			2	0.00308	0.006	0.062	40.25974	not relevar
474	Reflab_J	CAS_7439-92-1_Lead and its comp	RO-01 BS-R	43.6	Risky	Bad			41	131	23	1.063415	0.332824	not relevar
532	Natlab_	CAS_7439-92-1_Lead and its comp	RO-01 BS-R	51.2	Risky	Bad			41	131	23	1.24878	0.39084	not relevar
640	Reflab_J	CAS_7440-02-0_Nickel and its com	RO-01 BS-R	88.1	Risky	Bad			56.632	56.632	75.45	1.555658	1.555658	not relevar
648	Natlab_	CAS_7440-02-0_Nickel and its com	RO-01 BS-R	95.5	Risky	Bad			56.632	56.632	75.45	1.686326	1.686326	not relevar
641	_RO-011	EEA_33-56-7_Total PAHs (Benzo(a	RO-01 BS-C	0.221	Risky	Bad			0.0675	0.00675	0.001	3.274074	32.74074	not relevar
642	_RO-011	EEA_33-56-7_Total PAHs (Benzo(a	RO-01 BS-L	0.047	Risky	Bad			0.0675	0.00675	0.001	0.696296	6.962963	not relevar
643	_RO-011	EEA_33-56-7_Total PAHs (Benzo(a	RO-01 BS-R	0.111	Risky	Bad			0.0675	0.00675	0.001	1.644444	16.44444	not relevar
755	_RO-011	EEA_33-56-7_Total PAHs (Benzo(a	RO-01 BS-C	0.01	Risky	Bad			0.0675	0.00675	0.001	0.148148	1.481481	not relevar
756	_RO-011	EEA_33-56-7_Total PAHs (Benzo(a	RO-01 BS-L	0.157	Risky	Bad			0.0675	0.00675	0.001	2.322963	23.22963	not relevar
757	_RO-011	EEA_33-56-7_Total PAHs (Benzo(a	RO-01 BS-R	0.185	Risky	Bad			0.0675	0.00675	0.001	2.745185	27.45185	not relevar
834														



	B	F	J	K	W	X	Y	Z	AC	AD	AE	AH	AI	AJ
1	How to use this	2. Evaluate by EU standards (base	3. Evaluate by Nationa		Evaluation results 1/2.				Support fields for Evaluation results 1/2.					
					Based on EQS dossiers				QS values based on EQS dossiers			Comparisson to QS value based on EQS dossiers (Risk Ratio = C / QS)		
2	1. Filter to your country in	2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL		Risky / Not risky / unknown	Good / Bad / unkn	Evaluation result text	Evalution result notes	2) CHS in <63um = CHS in <2mm			2) CHS in <63um = CHS in <2mm		
3	column J! (eg. write	2/2. See the results in column	3/2. See the result						S-2000	S-2000	W-SPM	S-2000	S-2000	W-SPM
4		2/3. See the risk ratio in the c	3/3. See the risk r						QS benthic, freshwater	EQSsed.	EQSsusp.	R = C / QS benthic, freshwater	R = C / EQSsed.	R = C / EQSsusp.
5		2/4. Free to add any text in co	3/4. Free to add a											
6	Samp	observedPropertyDeterminan	sampleiden	rest	observed	lue								
1420	Natlab_	CAS_7439-92-1_Lead and its comp	RO-01-SS-R	36.6	Risky	Bad			41	131	23	not relevai	not relevai	1.5913
1508	Natlab_	CAS_7439-92-1_Lead and its comp	RO-01-SS-C	48.1	Risky	Bad			41	131	23	not relevai	not relevai	2.0913
1616	Natlab_	CAS_7440-02-0_Nickel and its com	RO-01-SS-C	76.1	Risky	Bad			56.632	56.632	75.45	not relevai	not relevai	1.00868
3834														
3835														

Fig. 3.9.2 Substances above the

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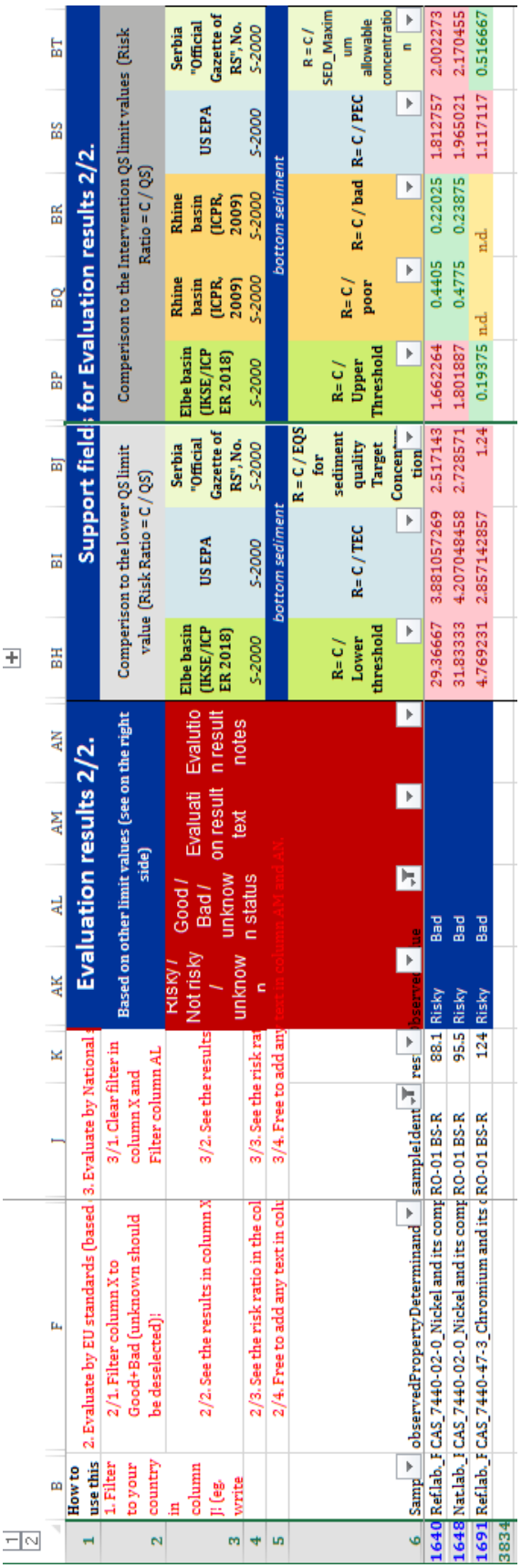

	B	F	J	K	AK	AL	AM	AN	BH	BI	BJ	BP	BQ	BR	BS	BT
1	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National		Evaluation results 2/2.				Support field: for Evaluation results 2/2.							
					Based on other limit values (see on the right side)				Comperison to the lower QS limit value (Risk Ratio = C / QS)			Comperison to the Intervention QS limit values (Risk Ratio = C / QS)				
2		2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL		Risky / Not risky / unknown	Good / Bad / unknown status	Evaluation result text	Evalutio n result notes	Elbe basin (IKSE/ICP ER 2018)	US EPA	Serbia "Official Gazette of RS", No.	Elbe basin (IKSE/ICP ER 2018)	Rhine basin (ICPR, 2009)	Rhine basin (ICPR, 2009)	US EPA	Serbia "Official Gazette of RS", No.
	in column J! (eg. write								S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000
3		2/2. See the results in column X	3/2. See the results						bottom sediment			bottom sediment				
4		2/3. See the risk ratio in the col	3/3. See the risk ra						R= C / Lower threshold	R= C / TEC	R = C / EQS for sediment quality Target Concen...	R= C / Upper Threshold	R= C / poor	R= C / bad	R= C / PEC	R = C / SED_Maximum allowable concentratio n
5		2/4. Free to add any text in colu	3/4. Free to add any													
6	Samp	observedPropertyDeterminand	sampleIdent	res	Observe	ue										
1640	Reflab_F	CAS_7440-02-0_Nickel and its comp	RO-01 BS-R	88.1	Risky	Bad			29.36667	3.881057269	2.517143	1.662264	0.4405	0.22025	1.812757	2.002273
1648	Natlab_I	CAS_7440-02-0_Nickel and its comp	RO-01 BS-R	95.5	Risky	Bad			31.83333	4.207048458	2.728571	1.801887	0.4775	0.23875	1.965021	2.170455
1691	Reflab_F	CAS_7440-47-3_Chromium and its c	RO-01 BS-R	124	Risky	Bad			4.769231	2.857142857	1.24	0.19375	n.d.	n.d.	1.117117	0.516667
3834																

Fig. 3.9.3 Substances above the national standards in the baseline station Bazias of Romania (bottom sediments), status "risky" and "bad"

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"risky" and "good"

Fig. 3.9.5 Substances above the national standards in the baseline station Bazias of Romania (flood plain sediments), status "risky" and "good"

	B	F	J	K	AK	AL	AM	AN	BM	BN	BO	BU	BV	BW	BX	BY	BZ
1	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National		Evaluation results 2/2.						Support fields for Evaluation results 2/2.						
	1. Filter to your country in column J! (eg. write	2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL		Based on other limit values (see on the right side)							Comperison to the Intervention QS limit values (Risk Ratio = C / QS)					
2		2/2. See the results in column X	3/2. See the results		Risky / Not risky / unknown	Good / Bad / unknown status	Evaluation result text	Evaluation result notes	wer QS limit value (Risk Ratio = C / QS)								
3		2/3. See the risk ratio in the col	3/3. See the risk rat						n legislation	Bulgaria	Serbia "Official Gazette of RS", No.	Dutch pollution list	Hungarian legislation (6/2009 (IV. 14.))	Romanian legislation		Bulgaria	Serbia "Official Gazette of RS", No. 50/2012
4		2/4. Free to add any text in colu	3/4. Free to add any						F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000	F-2000
5									oodplain sediment					floodplain sediment			
6	Sampl	observedPropertyDeterminandC	sampleIdenti	resu	reserved	ue			R = C /Alert value for non-sensitive land use categori	R = C / BG_Normal value	R = C / SOIL_Maximum allowable concentration	R= C / Interventi on value	R= C / Geological media	R = C/ Interventi on value for sensitive land use categori	R = C/ Interventi on value for non-sensitive land use categori	R = C/ BG_Intervention value	R = C/ SOIL_Concentration at which remediation of sediments is required
1406	Natlab._	CAS_7440-02-0_Nickel and its com	RO/01/FS/BS	35	Risky	Good			0.175	0.76087	1	0.166667	0.875	0.233333	0.07	0.116667	0.166666667
1426	Natlab._	CAS_7440-50-8_Copper and its com	RO/01/FS/BS	37	Risky	Good			0.148	1.088235	1.027778	0.194737	0.493333	0.185	0.074	0.074	0.194736842
1458	Natlab._	CAS_7440-50-8_Copper and its com	RO/01/FS/TS	41.3	Risky	Good			0.1652	1.214706	1.147222	0.217368	0.550667	0.2065	0.0826	0.0826	0.217368421
3834																	

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RO-02 Danube at Sulina

EU standards (EQS dossier)

Bottom sediments

High concentration in PAHs (Benzo(g,h,i)perylene, Anthracene, Benzo(a)pyrene, Fluoranthene, Total Benzo(b)fluoranthene + Total Benzo(k)fluoranthene and Total PAHs) were found by the reference laboratory measurements in the bottom sediment sample collected 50 m away from the left river bank of the Danube River (RO-02-BS-L). The risk ratio (Fig. 3.9.6) varies between 1.49 to as high as 126.3 (the latter for Fluoranthene).

Suspended sediments

The only substance with "bad" status is Lead and its compounds (national laboratory), present at all measured points of the profile (left, center, right: RO-02-SS-L, RO-02-SS-C, RO-02-SS-R), the risk ratio being between 1.01 and 1.09.

National standards

Bottom sediments

Bottom sediments collected 50 m away from the left Danube bank (RO-02-BS-L) have the status "risky" and "bad" for Anthracene and Fluoranthene, because the risk ratio values are a little above the **intervention** QS limit values (1.06, compared to Serbia "Official Gazette of RS", respectively 1.56 compared to Elbe basin upper threshold).

Regarding all other substances listed in Fig. 3.9.7, they have the status "risky", but "good", as they are above the **lower** QS limit values in Elbe Basin lower threshold (Nickel for all three points of the transversal profile on Danube at Sulina, in both reference and national laboratory), the risk ratio being between 4.63 and 7.43. Chromium on the right point of the profile (RO-02-BS-L) is also above Elbe Basin lower threshold and US EPA lower QS limit values (risk ratio values of 1.73, respectively 1.03). Indeno(1,2,3-cd)pyrene is above the lower QS limit value of Serbia "Official Gazette of RS", the risk ratio being small (1.58).

Floodplain sediments

Regarding the floodplain sediments in Sulina, they were sampled from the right bank of the Danube. Measurements from the national laboratory showed "risky" and "bad" status for Ni and its compounds (both in top soil TS and bottom soil BS), the risk ratio being a little above 1 (1.03 and 1.08) according to the **intervention** QS limit values in the Hungarian legislation (Fig. 3.9.8). The values are normal according to the Romanian and Bulgarian legislation and below the intervention QS limit values in all the rest of listed national legislations. For Fluoranthene, the levels are higher in both top soil (TS) and bottom soil (BS) according to the Bulgarian legislation (1.26 -3.03 times the intervention values – that is why the "bad" status), but below the alert values according to the Romanian legislation. The situation is similar for Benzo(a)pyrene in bottom soil (BS), with a risk ratio of 1.19.

Other "risky", but "good status" for floodplain sediments, found only in the measurements of the national laboratory show higher values for some PAHs in in bottom soil (Anthracene), in top soil

(Benzo(a)pyrene), as well as in both top soil TS and bottom soil BS (Indeno(1,2,3-cd)pyrene, Benzo(g,h,i)perylene) only according to the normal values in soils in Bulgaria.

Regarding metals, Zinc in top soil, Cadmium and Arsenic in bottom soil, Lead, Mercury and Copper in both top soil and bottom soil are also above the normal values in soils in Bulgaria. Nickel and Copper are also above the target value of the Dutch pollution list and the soil maximum allowable concentration of Serbia "Official Gazette of RS".

All substances measured in floodplain sediments at Sulina are below the alert values for sensitive land use categories in the Romanian legislation.

Conclusions for Sulina baseline station

By comparison with Bazias baseline station, the list of substances with "risky" and "bad status" compared with EQS dossier is shorter at Sulina (for bottom sediments). An explanation could be the fact that the Danube at Bazias has the regime of a lake, where finer sediments were deposited in time, trapping many HSs. At Sulina, the waterbody has the regime of a river polluted by human activities. As concerns the bottom sediments, the PAHs concentration can be explained by pollution from the heavy naval traffic along the Danube River. These pollutants result by incomplete combustion of fuel in ship engines and released in air as gas-phase or aerosols.

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

	B	F	J	K	W	X	Y	Z	AC	AD	AE	AH	AI	AJ
1	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National		Evaluation results 1/2. Based on EQS dossiers				Support fields for Evaluation results 1/2. QS values based on EQS dossiers			Comparisson to QS value based on EQS dossiers (Risk Ratio = C / QS)		
2	1. Filter to your country in column J! (eg. write	2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL		Risky / Not risky / unknown	Good / Bad / unkn own	Evaluation result text	Evalution result notes						
3		2/2. See the results in column	3/2. See the result						2) CHS in <63um = CHS in <2mm			2) CHS in <63um = CHS in <2mm		
4		2/3. See the risk ratio in the co	3/3. See the risk re						S-2000	S-2000	W-SPM	S-2000	S-2000	W-SPM
5		2/4. Free to add any text in col	3/4. Free to add an				text in column AM and AN!							
6	Samp	observedPropertyDeterminan	sampleIden	res	observe	lue			QS benthic, freshwater	EQSsed.	EQSsusp.	R = C / QS benthic, freshwater	R = C / EQSsed.	R = C / EQSsusp.
376		Reflab_1 CAS_191-24-2_Benzo(g,h,i)peryleı	RO-02 BS-L	0.077	Risky	Bad			0.042	0.042	0.073	1.833333	1.833333	not relevai
434		Reflab_1 CAS_120-12-7_Anthracene	RO-02 BS-L	0.106	Risky	Bad			0.024	0.15	0.029	4.416667	0.706667	not relevai
481		Reflab_1 CAS_50-32-8_Benzo(a)pyrene	RO-02 BS-L	0.137	Risky	Bad			0.0915	0.00707	0.001	1.497268	19.37765	not relevai
582		Reflab_1 EEA_32-23-5_Total Benzo(b)fluor	RO-02 BS-L	0.24	Risky	Bad			0.0675	0.00675	0.001	3.555556	35.55556	not relevai
694		Reflab_1 CAS_206-44-0_Fluoranthene	RO-02 BS-L	0.389	Risky	Bad			2	0.00308	0.006	0.1945	126.2987	not relevai
1266		Natlab_ CAS_7439-92-1_Lead and its comp	RO-02-SS-C	23.3	Risky	Bad			41	131	23	not relevai	not relevai	1.013043
1288		Natlab_ CAS_7439-92-1_Lead and its comp	RO-02-SS-R	24.9	Risky	Bad			41	131	23	not relevai	not relevai	1.082609
1291		Natlab_ CAS_7439-92-1_Lead and its comp	RO-02-SS-L	25	Risky	Bad			41	131	23	not relevai	not relevai	1.086957
3649		_RO-02 I EEA_33-56-7_Total PAHs (Benzo(a	RO-02 BS-L	0.549	Risky	Bad			0.0675	0.00675	0.001	8.133333	81.33333	not relevai
3834														

nia (bottom sediments and suspended sediments)

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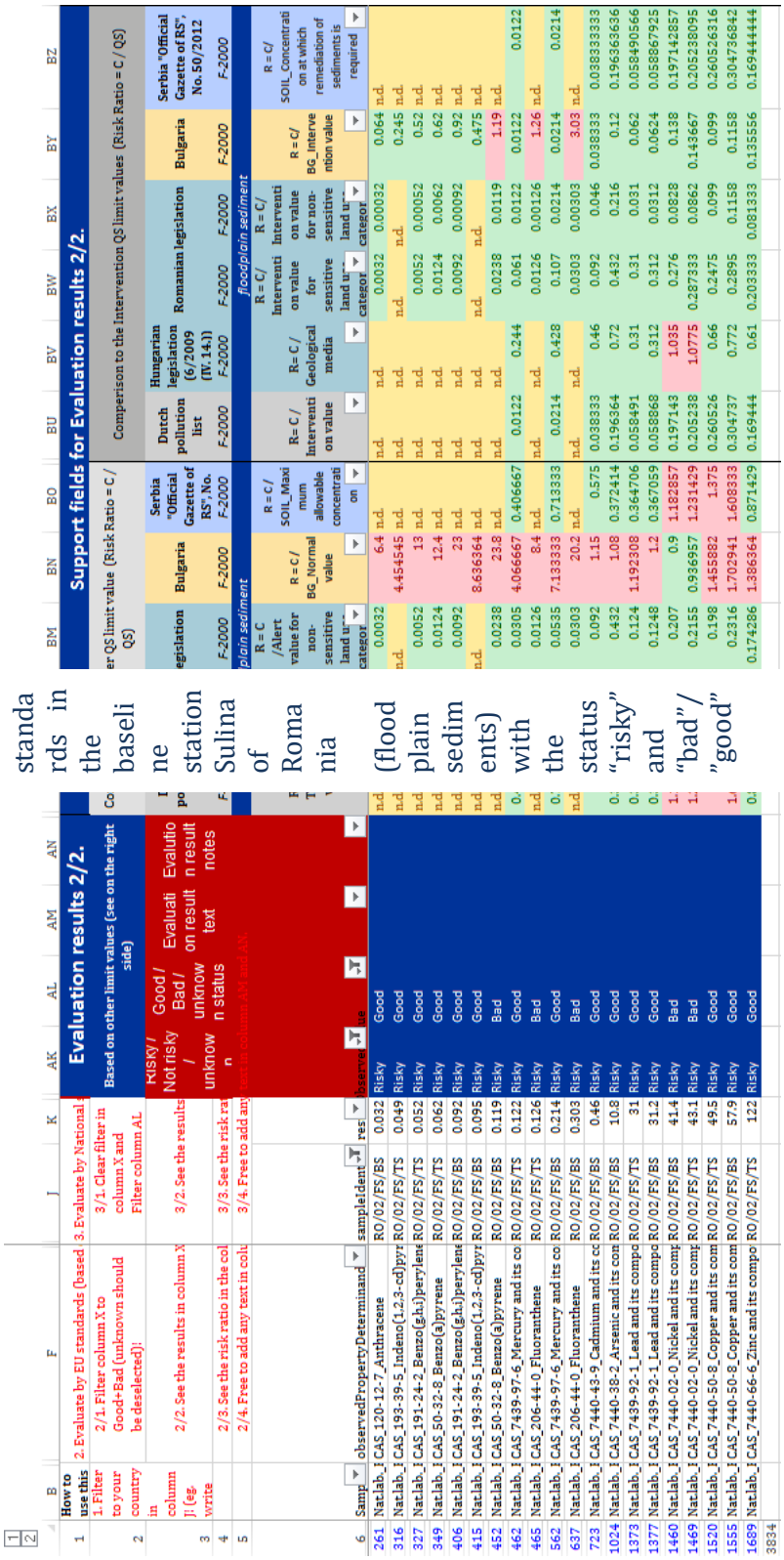
Fig. 3.9.7 Substances above the national standa

	B	F	J	K	AK	AL	AM	AN	BH	BI	BJ	BP	BQ	BR	BS	BT
					Evaluation results 2/2.				Support fields for Evaluation results 2/2.							
					Based on other limit values (see on the right side)				Comperison to the lower QS limit value (Risk Ratio = C / QS)			Comperison to the Intervention QS limit values (Risk Ratio = C / QS)				
1	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National													
2	1. Filter to your country in column J! (eg. write	2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL		Risky / Not risky / unknown	Good / Bad / unknown status	Evaluation result text	Evalution result notes	Elbe basin (IKSE/ICPER 2018)	US EPA	Official Gazette of RS", No. 50/2017	Elbe basin (IKSE/ICPER 2018)	Rhine basin (ICPR, 2009)	Rhine basin (ICPR, 2009)	US EPA	Official Gazette of RS", No. 50/2017
3		2/2. See the results in column	3/2. See the result						S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000
4		2/3. See the risk ratio in the co	3/3. See the risk ra						bottom sediment			bottom sediment				
5		2/4. Free to add any text in col	3/4. Free to add ar				text in column AM and AN		R= C / Lower threshold	R= C / TEC	R = C / EQS for sediment quality Target Concentration	R= C / Upper Threshold	R= C / poor	R= C / bad	R= C / PEC	R = C / SED_Maximum allowable concentration
6	Sam	observedPropertyDeterminan	sampleIden	res	bserve	tue										
414		Reflab_ CAS_193-39-5_Indeno(1,2,3-cd)py	RO-02 BS-L	0.095	Risky	Good			n.d.	n.d.	1.583333	n.d.	n.d.	n.d.	n.d.	0.015833
434		Reflab_ CAS_120-12-7_Anthracene	RO-02 BS-L	0.106	Risky	Bad			3.533333	0.001853	106	0.341935	n.d.	n.d.	0.125444	1.06
481		Reflab_ CAS_50-32-8_Benzo(a)pyrene	RO-02 BS-L	0.137	Risky	Good			13.7	0.913333	45.66667	0.228333	0.085625	0.042813	0.094483	0.045667
694		Reflab_ CAS_206-44-0_Fluoranthene	RO-02 BS-L	0.389	Risky	Bad			2.161111	0.919622	12.96667	1.556	n.d.	n.d.	0.174439	0.129667
1089		Reflab_ CAS_7440-02-0_Nickel and its com	RO-02 BS-C	13.9	Risky	Good			4.633333	0.612335	0.397143	0.262264	0.0695	0.03475	0.286008	0.315909
1138		Natlab_ CAS_7440-02-0_Nickel and its com	RO-02 BS-C	16.2	Risky	Good			5.4	0.713656	0.462857	0.30566	0.081	0.0405	0.333333	0.368182
1161		Natlab_ CAS_7440-02-0_Nickel and its com	RO-02 BS-R	17.1	Risky	Good			5.7	0.753304	0.488571	0.322642	0.0855	0.04275	0.351852	0.388636
1188		Reflab_ CAS_7440-02-0_Nickel and its com	RO-02 BS-R	18.5	Risky	Good			6.166667	0.814978	0.528571	0.349057	0.0925	0.04625	0.380658	0.420455
1212		Reflab_ CAS_7440-02-0_Nickel and its com	RO-02 BS-L	19.9	Risky	Good			6.633333	0.876652	0.568571	0.375472	0.0995	0.04975	0.409465	0.452273
1249		Natlab_ CAS_7440-02-0_Nickel and its com	RO-02 BS-L	22.3	Risky	Good			7.433333	0.982379	0.637143	0.420755	0.1115	0.05575	0.458848	0.506818
1489		Reflab_ CAS_7440-47-3_Chromium and its	RO-02 BS-R	45	Risky	Good			1.730769	1.036866	0.45	0.070313	n.d.	n.d.	0.405405	0.1875
3834																

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

Fig. 3.9.8 Substances above the national standards in the baseline station Sulina of Romania (flood plain sediments) with the status "risky" and "bad"/"good"



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3.10. SERBIA

The two sampling stations in Serbia are: SR-01 BS at Novi Sad and SR-02 BS Ram.

Both stations are on Danube River within the Iron Gate I reservoir and representative of the sediment quality along the Danube River upstream from the Iron Gate I reservoir.

The analysis results obtained by the Reference and National Laboratory are in agreement for all the parameters set and minor differences that have been observed are a consequence of the detection limits and limits of quantification in the National Laboratory.

With the exception of the CAS_7440-02-0_Nickel and its compounds, CAS_7439-92-1_Lead and its compounds and EEA_33-56-7_Total PAHs (Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(ghi)perylene, Indeno(1,2,3-cd)pyrene), the quality of sediments may be considered to be within the national standards and is not to be considered to be a source of risk for achieving good status of the surface water body status.

In the case of Nickel and its compounds the background concentrations of these substances are naturally higher than the threshold values set in national legislation and this is a problem to be considered by the national authorities and possible revision of the national standards.

In the case of Lead and its compounds and sediment concentrations at station SR-02 BS which is classified as being at risk, additional analysis and evaluation are necessary to establish the cause of the violation.

In the case of Total PAHs which are above threshold values and represent the risk we believe that the source of contamination is the deposition of the pollutant from air pollution and erosion and the main sources are probably emissions of pollutants from the coal fired thermal power stations and steel mills in the vicinity of the sampling stations. This needs to be studied further to determine the sources and quantify their impacts on sediment quality with respect to this parameter.

Fig. 3.10.1 Substances above

	B	F	J	K	W	X	Y	Z	AC	AD	AE	AH	AI	AJ
1	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National		Evaluation results 1/2.				Support fields for Evaluation results 1/2.					
2	1. Filter to your country in column J! (eg. write	2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL		Based on EQS dossiers				QS values based on EQS dossiers			Comparisson to QS value based on EQS dossiers (Risk Ratio = C / QS)		
3		2/2. See the results in column J!	3/2. See the result		Risky / Not risky / unknown	Good / Bad / unkn own	Evaluation result text	Evalution result notes	2) CHS in <63um = CHS in <2mm			2) CHS in <63um = CHS in <2mm		
4		2/3. See the risk ratio in the co	3/3. See the risk ra						S-2000	S-2000	W-SPM	S-2000	S-2000	W-SPM
5		2/4. Free to add any text in col	3/4. Free to add an											
6	Samp	observedPropertyDeterminan	sampleIden	res	bserva	lue			QS benthic, freshwater	EQSsed.	EQSsusp.	R = C / QS benthic, freshwater	R = C / EQSsed.	R = C / EQSsusp.
31	Reflab_	CAS_120-12-7_Anthracene	SR-01 BS	0.001	Not risky	Good			0.024	0.15	0.029	0.041667	0.006667	not relevai
50	Reflab_	CAS_50-32-8_Benzo(a)pyrene	SR-01 BS	0.002	Not risky	Good			0.0915	0.00707	0.001	0.021858	0.282885	not relevai
62	Reflab_	CAS_191-24-2_Benzo(g,h,i)perylen	SR-01 BS	0.003	Not risky	Good			0.042	0.042	0.073	0.071429	0.071429	not relevai
102	Reflab_	EEA_32-23-5_Total Benzo(b)fluor	SR-01 BS	0.006	Not risky	Good			0.0675	0.00675	0.001	0.088889	0.888889	not relevai
103	Reflab_	CAS_206-44-0_Fluoranthene	SR-01 BS	0.006	Risky	Bad			2	0.00308	0.006	0.003	1.948052	not relevai
987	Reflab_	CAS_7439-92-1_Lead and its comp	SR-01 BS	8.4	Not risky	Good			41	131	23	0.204878	0.064122	not relevai
1038	Reflab_	CAS_7440-02-0_Nickel and its com	SR-01 BS	11.4	Not risky	Good			56.632	56.632	75.45	0.2013	0.2013	not relevai
1167	Natlab_	CAS_7439-92-1_Lead and its comp	SR-01 BS	17.46	Not risky	Good			41	131	23	0.425736	0.133246	not relevai
1284	Natlab_	CAS_7440-02-0_Nickel and its com	SR-01 BS	24.61	Not risky	Good			56.632	56.632	75.45	0.434576	0.434576	not relevai
1967	Natlab_	CAS_120-12-7_Anthracene	SR-01 BS	0.01	Not risky	Good			0.024	0.15	0.029	0.208333	0.033333	not relevai
1968	Natlab_	CAS_50-32-8_Benzo(a)pyrene	SR-01 BS	0.01	Not risky	Good			0.0915	0.00707	0.001	0.054645	LOQ>limit	not relevai
1969	Natlab_	EEA_32-23-5_Total Benzo(b)fluor	SR-01 BS	0.01	Not risky	Good			0.0675	0.00675	0.001	0.074074	LOQ>limit	not relevai
1970	Natlab_	CAS_191-24-2_Benzo(g,h,i)perylen	SR-01 BS	0.01	Not risky	Good			0.042	0.042	0.073	0.119048	0.119048	not relevai
1971	Natlab_	CAS_206-44-0_Fluoranthene	SR-01 BS	0.01	Not risky	Good			2	0.00308	0.006	0.0025	LOQ>limit	not relevai
1974	Natlab_	CAS_608-73-1_Hexachlorocyclohe	SR-01 BS	0.01	Not risky	Good			0.0103	0.0103	0.011	0.485437	0.485437	not relevai
3184	Reflab_	CAS_608-73-1_Hexachlorocyclohe	SR-01 BS	0.005	Not risky	Good			0.0103	0.0103	0.011	0.242718	0.242718	not relevai
3186	Reflab_	CAS_124495-18-7_Quinoxyfen	SR-01 BS	0.005	Not risky	Good			0.0055	0.0055	0.027	0.454545	0.454545	not relevai
3220	Reflab_	CAS_608-73-1_Hexachlorocyclohe	SR-01 BS	0.005	Not risky	Good			0.0103	0.0103	0.011	0.242718	0.242718	not relevai
3334	Natlab_	CAS_608-73-1_Hexachlorocyclohe	SR-01 BS	0.01	Not risky	Good			0.0103	0.0103	0.011	0.485437	0.485437	not relevai
3677	_SR-01 E	EEA_33-56-7_Total PAHs (Benzo(a	SR-01 BS	0.015	Risky	Bad			0.0675	0.00675	0.001	0.222222	2.222222	not relevai
3792	_SR-01 E	EEA_33-56-7_Total PAHs (Benzo(a	SR-01 BS	0.01	Not risky	Good			0.0675	0.00675	0.001	0.074074	LOQ>limit	not relevai
3834														

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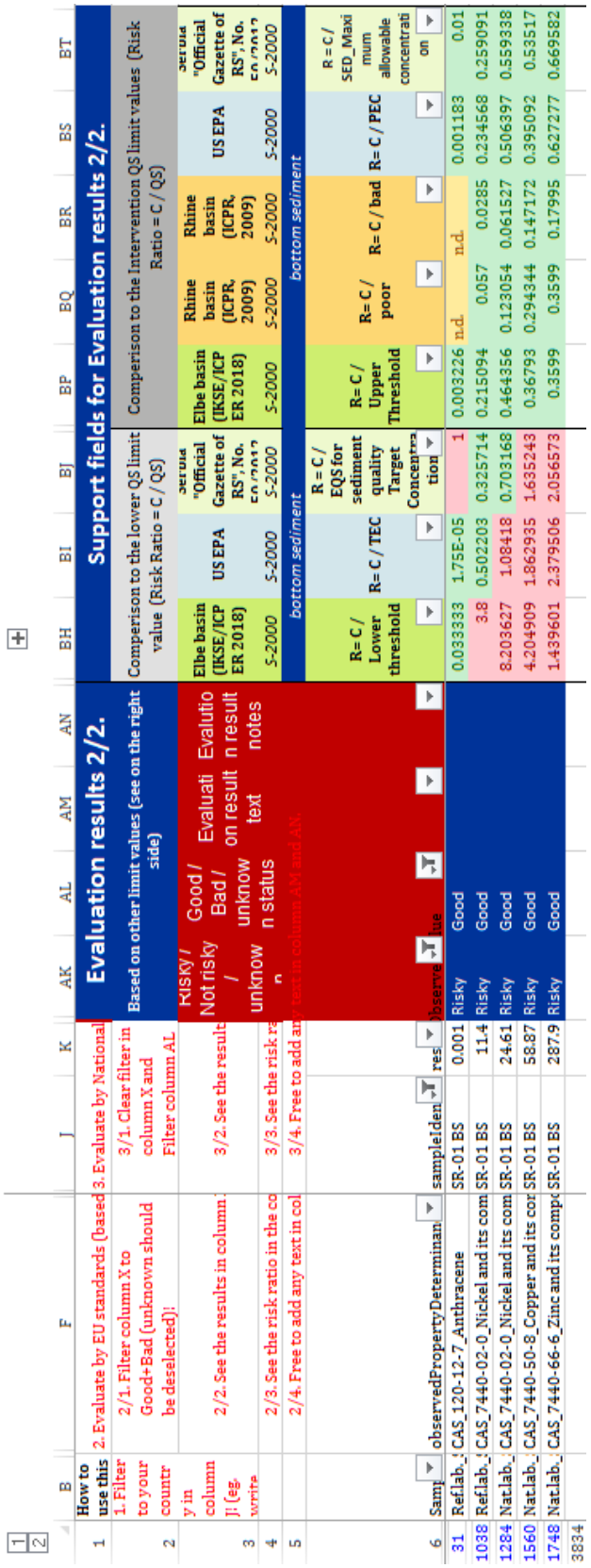

	B	F	J	K	AK	AL	AM	AN	BH	BI	BJ	BP	BQ	BR	BS	BT
1	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National		Evaluation results 2/2.				Support fields for Evaluation results 2/2.							
	1. Filter to your country in column J! (eg. write	2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL		Based on other limit values (see on the right side)				Comperison to the lower QS limit value (Risk Ratio = C / QS)			Comperison to the Intervention QS limit values (Risk Ratio = C / QS)				
2		2/2. See the results in column J!	3/2. See the result		Risky / Not risky / unknown	Good / Bad / unknown status	Evaluation result text	Evalution result notes	Elbe basin (IKSE/ICPER 2018)	US EPA	Official Gazette of RS", No. 50/2012	Elbe basin (IKSE/ICPER 2018)	Rhine basin (ICPR, 2009)	Rhine basin (ICPR, 2009)	US EPA	Official Gazette of RS", No. 50/2012
3									S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000
4		2/3. See the risk ratio in the co	3/3. See the risk ra						bottom sediment			bottom sediment				
5		2/4. Free to add any text in col	3/4. Free to add an		text in column AM and AN.				R= C / Lower threshold	R= C / TEC	R= C / EQS for sediment quality Target Concentration	R= C / Upper Threshold	R= C / poor	R= C / bad	R= C / PEC	R = C / SED_Maximum allowable concentration
6	Samp	observedPropertyDeterminan	sampleIden	res	observe	lue										
31	Reflab_	CAS_120-12-7_Anthracene	SR-01 BS	0.001	Risky	Good			0.033333	1.75E-05	1	0.003226	n.d.	n.d.	0.001183	0.01
1038	Reflab_	CAS_7440-02-0_Nickel and its com	SR-01 BS	11.4	Risky	Good			3.8	0.502203	0.325714	0.215094	0.057	0.0285	0.234568	0.259091
1284	Natlab_	CAS_7440-02-0_Nickel and its com	SR-01 BS	24.61	Risky	Good			8.203627	1.08418	0.703168	0.464356	0.123054	0.061527	0.506397	0.559338
1560	Natlab_	CAS_7440-50-8_Copper and its cor	SR-01 BS	58.87	Risky	Good			4.204909	1.862935	1.635243	0.36793	0.294344	0.147172	0.395092	0.53517
1748	Natlab_	CAS_7440-66-6_Zinc and its compo	SR-01 BS	287.9	Risky	Good			1.439601	2.379506	2.056573	0.3599	0.3599	0.17995	0.627277	0.669582
3834																

Fig. 3.10.2 Substances above the national standards in the baseline

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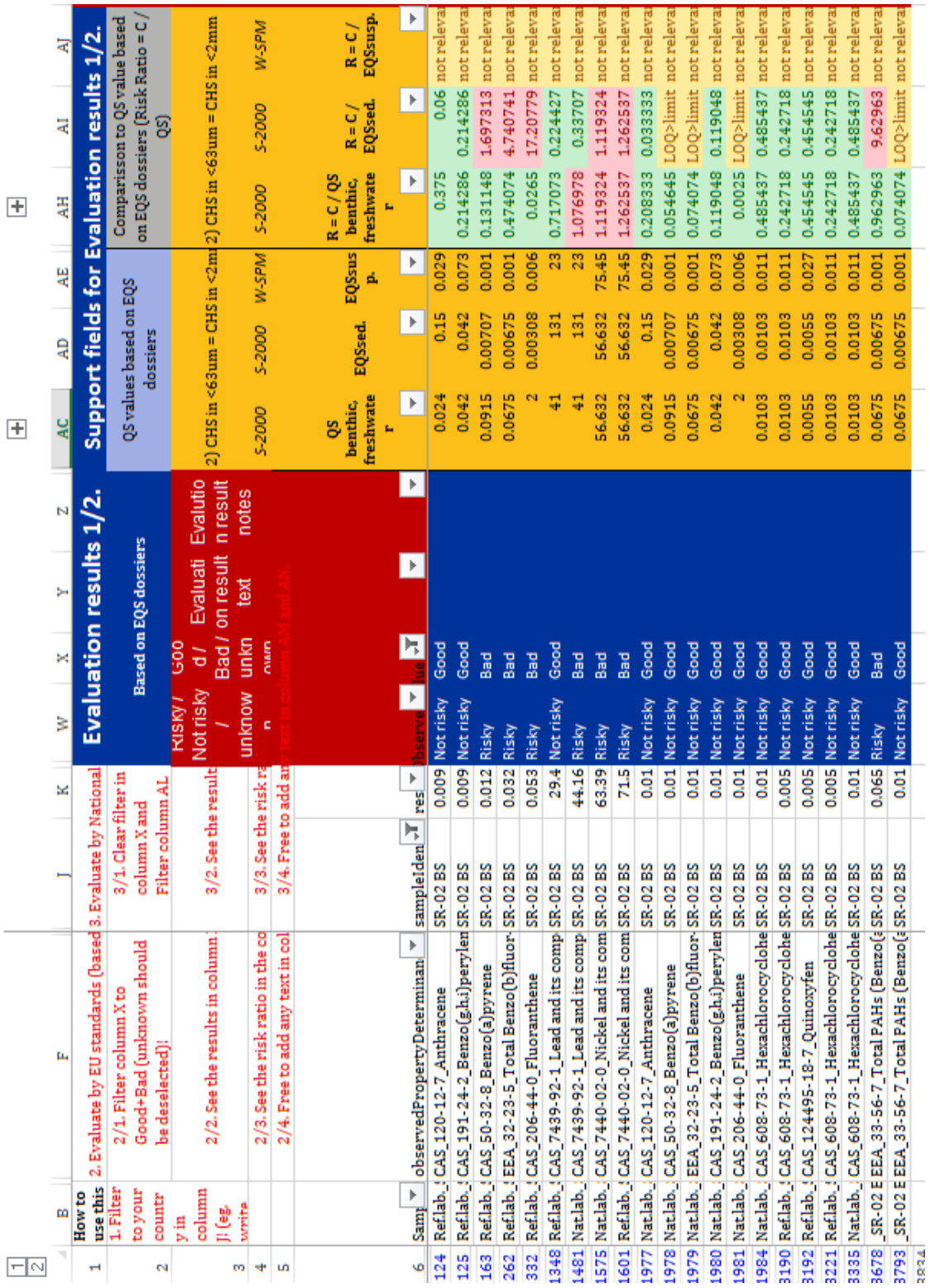
Fig. 3.10.3 Substances



	B	F	J	K	W	X	Y	Z	AC	AD	AE	AH	AI	AJ
1	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National		Evaluation results 1/2.				Support fields for Evaluation results 1/2.					
2	1. Filter to your country in column J! (eg. write	2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL		Based on EQS dossiers				QS values based on EQS dossiers			Comparisson to QS value based on EQS dossiers (Risk Ratio = C / QS)		
3		2/2. See the results in column J!	3/2. See the results		Risky / Not risky / unknown	Good / Bad / unknown	Evaluation result text	Evalution result notes	QS benthic, freshwater	EQSsed.	EQSsusp.	R = C / QS benthic, freshwater	R = C / EQSsed.	R = C / EQSsusp.
4		2/3. See the risk ratio in the co	3/3. See the risk ra						S-2000	S-2000	W-SPM	S-2000	S-2000	W-SPM
5		2/4. Free to add any text in col	3/4. Free to add an						2) CHS in <63um = CHS in <2mi			2) CHS in <63um = CHS in <2mm		
6	Samp	observedPropertyDeterminan	sampleIden	res	observe	lue								
124	Reflab_	CAS_120-12-7_Anthracene	SR-02 BS	0.009	Not risky	Good			0.024	0.15	0.029	0.375	0.06	notreleva
125	Reflab_	CAS_191-24-2_Benzo(g,h,i)perylen	SR-02 BS	0.009	Not risky	Good			0.042	0.042	0.073	0.214286	0.214286	notreleva
163	Reflab_	CAS_50-32-8_Benzo(a)pyrene	SR-02 BS	0.012	Risky	Bad			0.0915	0.00707	0.001	0.131148	1.697313	notreleva
262	Reflab_	EEA_32-23-5_Total Benzo(b)fluor	SR-02 BS	0.032	Risky	Bad			0.0675	0.00675	0.001	0.474074	4.740741	notreleva
332	Reflab_	CAS_206-44-0_Fluoranthene	SR-02 BS	0.053	Risky	Bad			2	0.00308	0.006	0.0265	17.20779	notreleva
1348	Reflab_	CAS_7439-92-1_Lead and its comp	SR-02 BS	29.4	Not risky	Good			41	131	23	0.717073	0.224427	notreleva
1481	Natlab_	CAS_7439-92-1_Lead and its comp	SR-02 BS	44.16	Risky	Bad			41	131	23	1.076978	0.33707	notreleva
1575	Natlab_	CAS_7440-02-0_Nickel and its com	SR-02 BS	63.39	Risky	Bad			56.632	56.632	75.45	1.119324	1.119324	notreleva
1601	Reflab_	CAS_7440-02-0_Nickel and its com	SR-02 BS	71.5	Risky	Bad			56.632	56.632	75.45	1.262537	1.262537	notreleva
1977	Natlab_	CAS_120-12-7_Anthracene	SR-02 BS	0.01	Not risky	Good			0.024	0.15	0.029	0.208333	0.033333	notreleva
1978	Natlab_	CAS_50-32-8_Benzo(a)pyrene	SR-02 BS	0.01	Not risky	Good			0.0915	0.00707	0.001	0.054645	LOQ>limit	notreleva
1979	Natlab_	EEA_32-23-5_Total Benzo(b)fluor	SR-02 BS	0.01	Not risky	Good			0.0675	0.00675	0.001	0.074074	LOQ>limit	notreleva
1980	Natlab_	CAS_191-24-2_Benzo(g,h,i)perylen	SR-02 BS	0.01	Not risky	Good			0.042	0.042	0.073	0.119048	0.119048	notreleva
1981	Natlab_	CAS_206-44-0_Fluoranthene	SR-02 BS	0.01	Not risky	Good			2	0.00308	0.006	0.0025	LOQ>limit	notreleva
1984	Natlab_	CAS_608-73-1_Hexachlorocyclohe	SR-02 BS	0.01	Not risky	Good			0.0103	0.0103	0.011	0.485437	0.485437	notreleva
3190	Reflab_	CAS_608-73-1_Hexachlorocyclohe	SR-02 BS	0.005	Not risky	Good			0.0103	0.0103	0.011	0.242718	0.242718	notreleva
3192	Reflab_	CAS_124495-18-7_Quinoxyfen	SR-02 BS	0.005	Not risky	Good			0.0055	0.0055	0.027	0.454545	0.454545	notreleva
3221	Reflab_	CAS_608-73-1_Hexachlorocyclohe	SR-02 BS	0.005	Not risky	Good			0.0103	0.0103	0.011	0.242718	0.242718	notreleva
3335	Natlab_	CAS_608-73-1_Hexachlorocyclohe	SR-02 BS	0.01	Not risky	Good			0.0103	0.0103	0.011	0.485437	0.485437	notreleva
3678	_SR-02 E	EEA_33-56-7_Total PAHs (Benzo(a	SR-02 BS	0.065	Risky	Bad			0.0675	0.00675	0.001	0.962963	9.62963	notreleva
3793	_SR-02 E	EEA_33-56-7_Total PAHs (Benzo(a	SR-02 BS	0.01	Not risky	Good			0.0675	0.00675	0.001	0.074074	LOQ>limit	notreleva

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Fig. 3.10.4 Substances above the

	B	F	J	K	AK	AL	AM	AN	BH	BI	BJ	BP	BQ	BR	BS	BT
1	How to use this	2. Evaluate by EU standards (based	3. Evaluate by National		Evaluation results 2/2.				Support fields for Evaluation results 2/2.							
	1. Filter to your country in column J! (eg. write	2/1. Filter column X to Good+Bad (unknown should be deselected)!	3/1. Clear filter in column X and Filter column AL		Based on other limit values (see on the right side)				Comperison to the lower QS limit value (Risk Ratio = C / QS)			Comperison to the Intervention QS limit values (Risk Ratio = C / QS)				
2		2/2. See the results in column	3/2. See the results		RISKY / Not risky / unknown	Good / Bad / unknown status	Evaluation result text	Evaluation result notes	Elbe basin (IKSE/ICPER 2018)	US EPA	Serbia "Official Gazette of RS", No. 50/2012	Elbe basin (IKSE/ICPER 2018)	Rhine basin (ICPR, 2009)	Rhine basin (ICPR, 2009)	US EPA	Serbia "Official Gazette of RS", No. 50/2012
3		2/3. See the risk ratio in the co	3/3. See the risk ra						S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000	S-2000
4		2/4. Free to add any text in col	3/4. Free to add an						bottom sediment					bottom sediment		
5									R= C / Lower threshold	R= C / TEC	R= C / EQS for sediment quality Target Concentration	R= C / Upper Threshold	R= C / poor	R= C / bad	R= C / PEC	R = C / SED_Maximum allowable concentration
6	Samp	observedPropertyDeterminan	sampleIden	res	Observe	lue										
124	Reflab_	CAS_120-12-7_Anthracene	SR-02 BS	0.009	Risky	Good			0.3	0.000157	9	0.029032	n.d.	n.d.	0.010651	0.09
163	Reflab_	CAS_50-32-8_Benzo(a)pyrene	SR-02 BS	0.012	Risky	Good			1.2	0.08	4	0.02	0.0075	0.00375	0.008276	0.004
332	Reflab_	CAS_206-44-0_Fluoranthene	SR-02 BS	0.053	Risky	Good			0.294444	0.125296	1.766667	0.212	n.d.	n.d.	0.023767	0.017667
738	Reflab_	CAS_7440-43-9_Cadmium and its c	SR-02 BS	0.54	Risky	Good			2.454545	0.545455	0.675	0.234783	0.135	0.0675	0.108434	0.084375
820	Natlab_	CAS_7440-43-9_Cadmium and its c	SR-02 BS	1.211	Risky	Good			5.504682	1.223263	1.513788	0.526535	0.302758	0.151379	0.243179	0.189223
1056	Reflab_	CAS_7440-38-2_Arsenic and its co	SR-02 BS	12	Risky	Good			1.518987	1.225741	0.413793	0.3	n.d.	n.d.	0.363636	0.285714
1311	Natlab_	CAS_7440-50-8_Copper and its cor	SR-02 BS	26.35	Risky	Good			1.882475	0.834008	0.732074	0.164717	0.131773	0.065887	0.176877	0.239588
1327	Reflab_	CAS_7440-50-8_Copper and its cor	SR-02 BS	27.3	Risky	Good			1.95	0.863924	0.758333	0.170625	0.1365	0.06825	0.183221	0.248182
1348	Reflab_	CAS_7439-92-1_Lead and its comp	SR-02 BS	29.4	Risky	Good			1.176	0.821229	0.345882	0.554717	0.0735	0.03675	0.229688	0.094839
1481	Natlab_	CAS_7439-92-1_Lead and its comp	SR-02 BS	44.16	Risky	Good			1.766244	1.233411	0.519484	0.833134	0.11039	0.055195	0.34497	0.142439
1497	Natlab_	CAS_7440-47-3_Chromium and its	SR-02 BS	46.46	Risky	Good			1.78674	1.070397	0.464552	0.072586	n.d.	n.d.	0.418516	0.193564
1575	Natlab_	CAS_7440-02-0_Nickel and its com	SR-02 BS	63.39	Risky	Bad			21.12985	2.792491	1.81113	1.196029	0.316948	0.158474	1.304312	1.440671
1601	Reflab_	CAS_7440-02-0_Nickel and its com	SR-02 BS	71.5	Risky	Bad			23.83333	3.14978	2.042857	1.349057	0.3575	0.17875	1.471193	1.625
1666	Reflab_	CAS_7440-47-3_Chromium and its	SR-02 BS	109	Risky	Good			4.192308	2.511521	1.09	0.170313	n.d.	n.d.	0.981982	0.454167
1694	Reflab_	CAS_7440-66-6_Zinc and its compo	SR-02 BS	129	Risky	Good			0.645	1.066116	0.921429	0.16125	0.16125	0.080625	0.281046	0.3
1698	Natlab_	CAS_7440-66-6_Zinc and its compo	SR-02 BS	139.1	Risky	Good			0.695613	1.149774	0.993733	0.173903	0.173903	0.086952	0.303099	0.323541
3834																

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3.11. SLOVAKIA

Results for SK-01 bottom sediments BS and suspended sediments SS

The origin of PAHs (benzo(a)perylene, fluoranthene, anthracene etc.) and heavy metals comes mainly from combustion of fossil fuels (mostly brown coal) in thermal power plant close to the sampling point (approx. 10 km away).

Another source of pollution is considered chemical industry just next to the thermal power plant. In the 70´s, there was in the upper part of stream, a rupture of dam with approx. 1,5 million m^3 of coal ashes, containing ashes with PAHs and heavy metals from thermal power plant. These ashes flooded a large area of riverbed and still nowadays act as a long term source of PAHs and heavy metals.

Next source is also mining and its processing (smelters) in Horná Nitra region (source of metals like arsenic, cadmium, zinc etc.).

Potential source also could be long term agricultural activity in whole region of Nitra River.

The status according to EU standards is presented in Fig. 3.11.1.

Results for SK-02 bottom sediments BS and suspended sediments SS

Main source of pollution is considered historical longtime mining activity and ore processing (smelters and fossil fuel-coal combustion) in surrounding areas of river basin (source of heavy metals and PAHs).

The other source could be solid and municipal waste, which mainly come from surrounding municipalities (sewers, "black" junkyards).

Agriculture with pesticides application can have also some contamination impact.

The status according to EU standards is presented in Fig. 3.11.2.

Active floodplain (overbank) sediments

There is no national legislation for floodplains in Slovakia, therefore the soils limit values were used from the "Decree of the Ministry of Agriculture of the Slovak Republic of 23 August 2004, which implements § 27 of Act no. 220/2004 Coll. on the protection and use of agricultural land and amening Act no. 245/2003 Coll. on Integrated Pollution Prevention and Control and on the amendment of certain laws (in Slovak)".

Table 3.11 shows the values of floodplain sediments (both “top soil” TS and “bottom soil” BS) overpassing the national EQ limits for soils.

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How to use this 'Evaluation sheet'?
1. Filter to your country in column J! (eg. write "HU" or

2. Evaluate by EU standards (based on ES dossiers):
2/1. Filter column X to Good+Bad (unknown
2/2. See the results in column X! (Good/Bad)
2/3. See the risk ratio in the column AH-AJ!
2/4. Free to add any text in column Y and Z.

3. Evaluate by National standards (based on ES dossiers):
3/1. Clear filter in column X and Filter
3/2. See the results in column AL! (Good/Bad)
3/3. See the risk ratio in the column BH-BZ! (See used standard
3/4. Free to add any text in column AM and AN.

Row	A: No	B: Samp	C	D	E	F: observedPropertyDeterminand	G: proce	H: result	I: phen	J: sampleIde	K: res	L: res	M: pro	N: pa	O	U	V: Remark
186	180	Ref.lab._	m	Pr	R\	CAS_120-12-7_Anthracene	S-2000	mg/kg	missing	SK01 BS	0,02	false	0	unkn	5	A	Ref.lab.-sa
218	212	Nat.lab._	m	Pr	R\	CAS_191-24-2_Benzo(g,h,i)peryler	S-2000	mg/kg	missing	SK01 BS	0,02	false	0,01	unkn	5	A	Nat.lab.-sa
333	327	Nat.lab._	m	Pr	R\	CAS_120-12-7_Anthracene	S-2000	mg/kg	missing	SK01 BS	0,05	false	0,01	unkn	5	A	Nat.lab.-sa
368	362	Ref.lab._	m	Pr	R\	CAS_50-32-8_Benzo(a)pyrene	S-2000	mg/kg	missing	SK01 BS	0,07	false	0	unkn	5	A	Ref.lab.-sa
379	373	Nat.lab._	m	Pr	R\	CAS_50-32-8_Benzo(a)pyrene	S-2000	mg/kg	missing	SK01 BS	0,08	false	0,01	unkn	5	A	Nat.lab.-sa
409	403	Ref.lab._	m	Pr	R\	CAS_120-12-7_Anthracene	W-SPM	mg/kg	missing	SK01 SS	0,09	false	0	unkn	-	A	Ref.lab.-sa
448	442	Nat.lab._	m	Pr	R\	EEA_32-23-5_Total Benzo(b)fluor	S-2000	mg/kg	missing	SK01 BS	0,12	false	0,01	unkn	5	A	Nat.lab.-sa
509	503	Ref.lab._	m	Pr	R\	EEA_32-23-5_Total Benzo(b)fluor	S-2000	mg/kg	missing	SK01 BS	0,16	false	0	unkn	5	A	Ref.lab.-sa
510	504	Ref.lab._	m	Pr	R\	CAS_191-24-2_Benzo(g,h,i)peryler	W-SPM	mg/kg	missing	SK01 SS	0,16	false	0	unkn	-	A	Ref.lab.-sa
521	515	Ref.lab._	m	Pr	R\	CAS_206-44-0_Fluoranthene	S-2000	mg/kg	missing	SK01 BS	0,17	false	0	unkn	5	A	Ref.lab.-sa
546	540	Ref.lab._	m	Pr	R\	CAS_50-32-8_Benzo(a)pyrene	W-SPM	mg/kg	missing	SK01 SS	0,19	false	0	unkn	-	A	Ref.lab.-sa
630	624	Nat.lab._	m	Pr	R\	CAS_206-44-0_Fluoranthene	S-2000	mg/kg	missing	SK01 BS	0,28	false	0,01	unkn	5	A	Nat.lab.-sa
746	740	Ref.lab._	m	Pr	R\	CAS_206-44-0_Fluoranthene	W-SPM	mg/kg	missing	SK01 SS	0,58	false	0	unkn	-	A	Ref.lab.-sa
1097	###	Ref.lab._	m	Pr	R\	CAS_7440-02-0_Nickel and its con	W-SPM	mg/kg	missing	SK01 SS	14,1	false	0,01	unkn	-	A	Ref.lab.-sa
1105	###	Ref.lab._	m	Pr	R\	CAS_7440-02-0_Nickel and its con	S-2000	mg/kg	missing	SK01 BS	14,4	false	0,01	unkn	5	A	Ref.lab.-sa
1141	###	Ref.lab._	m	Pr	R\	CAS_7439-92-1_Lead and its comp	S-2000	mg/kg	missing	SK01 BS	16,2	false	0,01	unkn	5	A	Ref.lab.-sa
1148	###	Ref.lab._	m	Pr	R\	CAS_7439-92-1_Lead and its comp	W-SPM	mg/kg	missing	SK01 SS	16,7	false	0,01	unkn	-	A	Ref.lab.-sa
1203	###	Nat.lab._	m	Pr	R\	CAS_7440-02-0_Nickel and its con	S-2000	mg/kg	missing	SK01 BS	19	false	2	unkn	5	A	Nat.lab.-sa
1237	###	Nat.lab._	m	Pr	R\	CAS_7439-92-1_Lead and its comp	S-2000	mg/kg	missing	SK01 BS	21,5	false	0,5	unkn	5	A	Nat.lab.-sa
3106	###	Ref.lab._	m	Pr	R\	CAS_191-24-2_Benzo(g,h,i)peryler	S-2000	mg/kg	missing	SK01 BS	0	true	0	unkn	5	A	Ref.lab.-sa
3112	###	Ref.lab._	m	Pr	R\	CAS_608-73-1_Hexachlorocyclohe	S-2000	mg/kg	missing	SK01 BS	0,01	true	0,01	unkn	5	A	Ref.lab.-sa
3113	###	Nat.lab._	m	Pr	R\	CAS_608-73-1_Hexachlorocyclohe	S-2000	mg/kg	missing	SK01 BS	0,01	true	0,01	unkn	5	A	Nat.lab.-sa
3117	###	Ref.lab._	m	Pr	R\	CAS_124495-18-7_Quinoxyfen	S-2000	mg/kg	missing	SK01 BS	0,01	true	0,01	unkn	5	A	Ref.lab.-sa
3137	###	Ref.lab._	m	Pr	R\	EEA_32-23-5_Total Benzo(b)fluor	W-SPM	mg/kg	missing	SK01 SS	0	true	0	unkn	-	A	Ref.lab.-sa
3141	###	Ref.lab._	m	Pr	R\	CAS_608-73-1_Hexachlorocyclohe	W-SPM	mg/kg	missing	SK01 SS	0,01	true	0,01	unkn	-	A	Ref.lab.-sa
3143	###	Ref.lab._	m	Pr	R\	CAS_124495-18-7_Quinoxyfen	W-SPM	mg/kg	missing	SK01 SS	0,01	true	0,01	unkn	-	A	Ref.lab.-sa
3325	Adde	Nat.lab._	m	Pr	R\	CAS_608-73-1_Hexachlorocyclohe	S-2000	mg/kg	missing	SK01 BS	0,01	true	0,01	unkn	5	A	Nat.lab.-sa
3328	Adde	Nat.lab._	m	Pr	R\	CAS_608-73-1_Hexachlorocyclohe	W-SPM	mg/kg	missing	SK01 SS	0	not ana	0	unkn	-	L	Nat.lab.-sa
3557	Adde	Nat.lab._	m	Pr	R\	EEA_33-50-1_Heptachlor and hep	W-SPM	mg/kg	missing	SK01 SS	0	not ana	0	unkn	-	L	Nat.lab.-sa
3668	Adde	_SK01 B	m	Pr	R\	EEA_33-56-7_Total PAHs (Benzo(a	S-2000	mg/kg	missing	SK01 BS	0,23	false	0	unkn	5	A	Ref.lab.-sa
3672	Adde	_SK01 S	m	Pr	R\	EEA_33-56-7_Total PAHs (Benzo(a	W-SPM	mg/kg	missing	SK01 SS	0,61	false	0	unkn	-	A	Ref.lab.-sa
3783	Adde	_SK01 B	m	Pr	R\	EEA_33-56-7_Total PAHs (Benzo(a	S-2000	mg/kg	missing	SK01 BS	0,25	false	0	unkn	5	A	Nat.lab.-sa
3786	Adde	_SK01 S	m	Pr	R\	EEA_33-56-7_Total PAHs (Benzo(a	W-SPM	mg/kg	missing	SK01 SS	0	not ana	0	unkn	-	L	Nat.lab.-sa
3826	Adde	Ref.lab._	m	Pr	R\	CAS_608-73-1_Hexachlorocyclohe	S-2000	mg/kg	missing	SK01 BS	0,01	true	0,01	unkn	5	A	Ref.lab.-sa
3829	Adde	Ref.lab._	m	Pr	R\	CAS_608-73-1_Hexachlorocyclohe	W-SPM	mg/kg	missing	SK01 SS	0,01	true	0,01	unkn	-	A	Ref.lab.-sa

Row	Evaluation results 1/2. Based on EQS dossiers				Support fields for Evaluation results 1/2. QS values based on EQS: 2) CHS in <63um = CHS in <2			Comparisson to QS value based: 2) CHS in <63um = CHS in <2mm			Evaluation results 2/2. Based on other limit values (see on the right				Comperison to the … (bottom sediment)		
	W: Risky / Not risky /	X: Good / Bad /	Y: Evaluation result text	Z: Evalution result notes	AC: S-2000 QS benthic freshwa	AD: S-2000 EQSsed	AE: W-SPM EQSsusp.	AH: S-2000 R = C / QS benthic freshwa	AI: S-2000 R = C / EQSse	AJ: W-SPM R = C / EQSsus	AK: Risky / Not risky /	AL: Good / Bad / unknown	AM: Evaluation result text	AN: Evalution result notes	BH: Elbe basin (IKSE/ICPER 2018) S-2000 R= C / Lower thresh	BI: US EPA S-2000 R= C / TEC	BJ: Serbia "Official Gazette of S-2000 R = C / EQS for sedime
186	Not risky	Good			0,024	0,15	0,029	0,625	0,1	not releva	Risky	Good			0,5	0,00026	15
218	Not risky	Good			0,042	0,042	0,073	0,52381	0,52381	not releva	Not risky	Good			n.d.	n.d.	0,275
333	Risky	Bad	The origin of PAHs (b		0,024	0,15	0,029	2,25	0,36	not releva	Risky	Good			1,8	0,00094	54
368	Risky	Bad	The origin of PAHs (b		0,0915	0,00707	0,001	0,77596	10,0424	not releva	Risky	Good			7,1	0,47333	23,6667
379	Risky	Bad	The origin of PAHs (b		0,0915	0,00707	0,001	0,86339	11,174	not releva	Risky	Good			7,9	0,52667	26,3333
409	Risky	Bad	The origin of PAHs (b		0,024	0,15	0,029	not releva	not releva	3,16542	unknown	unknown			not releva	not releva	not releva
448	Risky	Bad	The origin of PAHs (b		0,0675	0,00675	0,001	1,71852	17,1852	not releva	unknown	unknown			n.d.	n.d.	n.d.
509	Risky	Bad	The origin of PAHs (b		0,0675	0,00675	0,001	2,32593	23,2593	not releva	unknown	unknown			n.d.	n.d.	n.d.
510	Risky	Bad	The origin of PAHs (b		0,042	0,042	0,073	not releva	not releva	2,15956	unknown	unknown			not releva	not releva	not releva
521	Risky	Bad	The origin of PAHs (b		2	0,00308	0,006	0,083	53,8961	not releva	Risky	Good			0,92222	0,39243	5,53333
546	Risky	Bad	The origin of PAHs (b		0,0915	0,00707	0,001	not releva	not releva	152,745	unknown	unknown			not releva	not releva	not releva
630	Risky	Bad	The origin of PAHs (b		2	0,00308	0,006	0,141	91,5584	not releva	Risky	Bad	The origin of PAHs (b		1,56667	0,66667	9,4
746	Risky	Bad	The origin of PAHs (b		2	0,00308	0,006	not releva	not releva	95,4233	unknown	unknown			not releva	not releva	not releva
1097	Not risky	Good			56,632	56,632	75,45	not releva	not releva	0,18689	unknown	unknown			not releva	not releva	not releva
1105	Not risky	Good			56,632	56,632	75,45	0,25427	0,25427	not releva	Risky	Good			4,8	0,63436	0,41143
1141	Not risky	Good			41	131	23	0,39512	0,12366	not releva	Not risky	Good			0,648	0,45251	0,19059
1148	Not risky	Good			41	131	23	not releva	not releva	0,72609	unknown	unknown			not releva	not releva	not releva
1203	Not risky	Good			56,632	56,632	75,45	0,3355	0,3355	not releva	Risky	Good			6,33333	0,837	0,54286
1237	Not risky	Good			41	131	23	0,52439	0,16412	not releva	Not risky	Good			0,86	0,60056	0,25294
3106	Not risky	Good			0,042	0,042	0,073	0,0119	0,0119	not releva	Not risky	Good			n.d.	n.d.	0,00625
3112	Not risky	Good			0,0103	0,0103	0,011	0,24272	0,24272	not releva	Not risky	unknown			LOQ>limit	LOQ>limit	0,00025
3113	Not risky	Good			0,0103	0,0103	0,011	0,48544	0,48544	not releva	Not risky	unknown			LOQ>limit	LOQ>limit	0,0005
3117	Not risky	Good			0,0055	0,0055	0,027	0,45455	0,45455	not releva	unknown	unknown			n.d.	n.d.	n.d.
3137	Not risky	Good			0,0675	0,00675	0,001	not releva	not releva	0,41322	unknown	unknown			not releva	not releva	not releva
3141	Not risky	Good			0,0103	0,0103	0,011	not releva	not releva	0,23148	unknown	unknown			not releva	not releva	not releva
3143	Not risky	Good			0,0055	0,0055	0,027	not releva	not releva	0,09124	unknown	unknown			not releva	not releva	not releva
3325	Not risky	Good			0,0103	0,0103	0,011	0,48544	0,48544	not releva	Not risky	unknown			LOQ>limit	LOQ>limit	0,0005
3328	Not risky	Good			0,0103	0,0103	0,011	not releva	not releva	0	unknown	unknown			not releva	not releva	not releva
3557	Not risky	Good			1,5E-05	1,1E-07	3E-06	not releva	not releva	0	unknown	unknown			not releva	not releva	not releva
3668	Risky	Bad	The origin of PAHs (b		0,0675	0,00675	0,001	3,37778	33,7778	not releva	Not risky	Good			0,38	0,14161	0,228
3672	Risky	Bad	The origin of PAHs (b		0,0675	0,00675	0,001	not releva	not releva	500,826	unknown	unknown			not releva	not releva	not releva
3783	Risky	Bad	The origin of PAHs (b		0,0675	0,00675	0,001	3,76296	37,6296	not releva	Not risky	Good			0,42333	0,15776	0,254
3786	Not risky	Good			0,0675	0,00675	0,001	not releva	not releva	0	unknown	unknown			not releva	not releva	not releva
3826	Not risky	Good			0,0103	0,0103	0,011	0,24272	0,24272	not releva	Not risky	unknown			LOQ>limit	LOQ>limit	0,00025
3829	Not risky	Good			0,0103	0,0103	0,011	not releva	not releva	0,23148	unknown	unknown			not releva	not releva	not releva

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Fig. 3.11.1 Substances over the European standards in the baseline station SK-01 (bottom sediments BS and suspended sediments SS) in Slovakia

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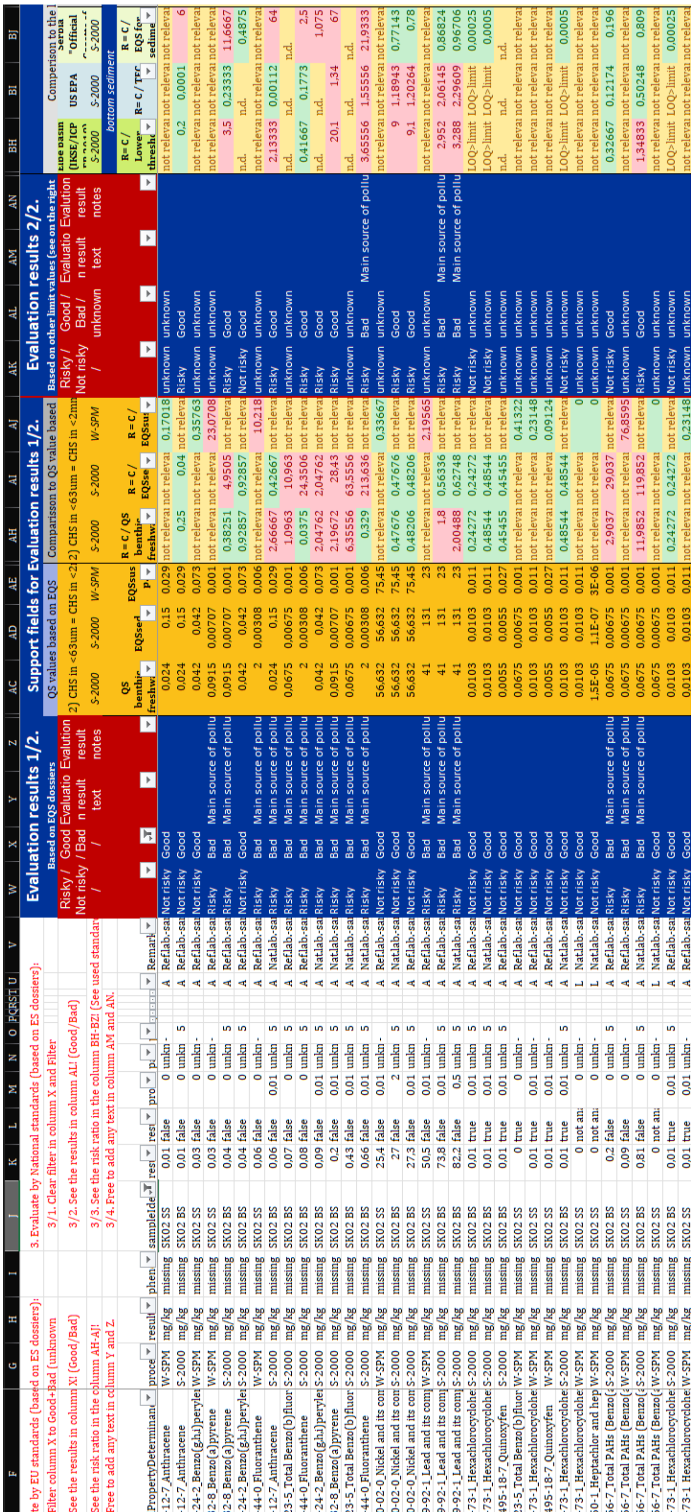

Fig. 3.11.2 Substances over the European standards in the baseline station SK-02 (bottom sediments BS and suspended sediments SS) in Slovakia

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

Table 3.11 Values of active floodplain sediments overpassing the Slovak limits of HSs in soils

Sample Id	Measured concentration (mg/kg of dry mass)	Remarks	Chemical parameter	Limit value EQ (mg/kg of dry mass)	Comment
SK01 FS TS	0.05	Ref.lab.-s	Anthracene	0.05	
SK02 FS BS	0.055	Nat.lab.-s	Anthracene	0.05	
SK01 FS TS	0.101	Ref.lab.-s	Indeno(1,2,3-cd)pyrene	0.1	
SK02 FS TS	0.108	Nat.lab.-s	Indeno(1,2,3-cd)pyrene	0.1	
SK02 FS BS	0.112	Nat.lab.-s	Indeno(1,2,3-cd)pyrene	0.1	
SK02 FS BS	0.13	Nat.lab.-s	Benzo(a)pyrene	0.1	
SK02 FS TS	0.132	Ref.lab.-s	Benzo(g,h,i)perylene	0.1	
SK02 FS TS	0.137	Nat.lab.-s	Benzo(a)pyrene	0.1	
SK02 FS BS	0.143	Ref.lab.-s	Benzo(g,h,i)perylene	0.1	
SK01 FS BS	0.16	Ref.lab.-s	Fluoranthene	0.05	
SK01 FS BS	0.183	Nat.lab.-s	Fluoranthene	0.05	
SK02 FS TS	0.21	Ref.lab.-s	Benzo(a)pyrene	0.1	
SK02 FS TS	0.214	Ref.lab.-s	Indeno(1,2,3-cd)pyrene	0.1	
SK02 FS BS	0.219	Ref.lab.-s	Benzo(a)pyrene	0.1	
SK02 FS BS	0.227	Ref.lab.-s	Indeno(1,2,3-cd)pyrene	0.1	
SK01 FS TS	0.228	Nat.lab.-s	Fluoranthene	0.05	
SK01 FS TS	0.316	Ref.lab.-s	Fluoranthene	0.05	
SK02 FS TS	0.396	Nat.lab.-s	Fluoranthene	0.05	
SK02 FS TS	0.405	Ref.lab.-s	Fluoranthene	0.05	
SK02 FS TS	0.43	Ref.lab.-sampling	Cadmium and its compounds	0.4	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS BS	0.45	Ref.lab.-sampling	Fluoranthene	0.05	
SK02 FS BS	0.51	Ref.lab.-sampling	Cadmium and its compounds	0.4	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS BS	0.646	Nat.lab.-sampling	Cadmium and its compounds	0.4	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS BS	0.649	Nat.lab.-sampling	Fluoranthene	0.05	
SK02 FS TS	0.757	Nat.lab.-sampling	Cadmium and its compounds	0.4	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK01 FS TS	1.13	Nat.lab.-sampling	Mercury and its compounds	0.15	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK01 FS TS	1.2	Ref.lab.-sampling	Mercury and its compounds	0.15	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS TS	1.23	Ref.lab.-sampling	Mercury and its compounds	0.15	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS BS	1.65	Ref.lab.-sampling	Mercury and its compounds	0.15	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS TS	1.84	Nat.lab.-sampling	Mercury and its compounds	0.15	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK01 FS BS	2.11	Nat.lab.-sampling	Mercury and its compounds	0.15	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK01 FS BS	2.5	Ref.lab.-sampling	Mercury and its compounds	0.15	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS BS	4.14	Nat.lab.-sampling	Mercury and its compounds	0.15	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent

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Sample Id	Measured concentration (mg/kg of dry mass)	Remarks	Chemical parameter	Limit value EQ (mg/kg of dry mass)	Comment
SK01 FS TS	13.9	Ref.lab.-sampling	Arsenic and its compounds	10	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK01 FS TS	15.6	Nat.lab.-sampling	Arsenic and its compounds	10	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK01 FS BS	20.9	Ref.lab.-sampling	Arsenic and its compounds	10	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK01 FS BS	21.3	Nat.lab.-sampling	Arsenic and its compounds	10	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS TS	61.9	Ref.lab.-sampling	Arsenic and its compounds	10	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS TS	63	Nat.lab.-sampling	Arsenic and its compounds	10	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS BS	82.7	Ref.lab.-sampling	Arsenic and its compounds	10	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS BS	87.5	Nat.lab.-sampling	Arsenic and its compounds	10	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS BS	96.4	Ref.lab.-sampling	Lead and its compounds	25	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS TS	111	Ref.lab.-sampling	Lead and its compounds	25	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS BS	125	Nat.lab.-sampling	Lead and its compounds	25	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS TS	136.7	Nat.lab.-sampling	Lead and its compounds	25	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS TS	209	Nat.lab.-sampling	Zinc and its compounds	100	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS TS	220	Ref.lab.-sampling	Zinc and its compounds	100	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS BS	237	Ref.lab.-sampling	Zinc and its compounds	100	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS BS	237	Nat.lab.-sampling	Zinc and its compounds	100	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS TS	304	Ref.lab.-sampling	Copper and its compounds	30	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS TS	336	Nat.lab.-sampling	Copper and its compounds	30	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS BS	549	Ref.lab.-sampling	Copper and its compounds	30	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent
SK02 FS BS	644	Nat.lab.-sampling	Copper and its compounds	30	limit value for sandy and loam-sandy soil type (lower limit value) - pH dependent

Sample Id	Measured concentration (mg/kg of dry mass)	Remarks	Chemical parameter	Limit value EQ (mg/kg of dry mass)	Comment
SK01 FS BS	**0.01**	Nat.lab.-s	Hexachlorocyclohexane	0.01	
SK01 FS BS	**0.01**	Nat.lab.-s	Hexachlorobenzene	0.01	
SK01 FS TS	**0.01**	Nat.lab.-s	Hexachlorocyclohexane	0.01	
SK01 FS TS	**0.01**	Nat.lab.-s	Hexachlorobenzene	0.01	
SK02 FS BS	**0.01**	Nat.lab.-s	Hexachlorocyclohexane	0.01	
SK02 FS BS	**0.01**	Nat.lab.-s	Hexachlorobenzene	0.01	
SK02 FS TS	**0.01**	Nat.lab.-s	Heptachlor epoxide	-	
SK02 FS TS	**0.01**	Nat.lab.-s	Hexachlorocyclohexane	0.01	
SK02 FS TS	**0.01**	Nat.lab.-s	Hexachlorobenzene	0.01	
SK01 FS BS	**0.01**	Nat.lab.-s	Hexachlorocyclohexane	0.01	
SK01 FS TS	**0.01**	Nat.lab.-s	Hexachlorocyclohexane	0.01	
SK02 FS BS	**0.01**	Nat.lab.-s	Hexachlorocyclohexane	0.01	
SK02 FS TS	**0.01**	Nat.lab.-s	Hexachlorocyclohexane	0.01	

Measured concentrations depicted in red colour are above the threashods of HSs in soils, according to the Slovakian legislation "Decree of the Ministry of Agriculture of the Slovak Republic of 23 August 2004, which implements § 27 of Act no. 220/2004 Coll. on the protection and use of agricultural land and amending Act no. 245/2003 Coll. on Integrated Pollution Prevention and Control and on the amendment of certain laws" (in Slovak).

Measured concentrations depicted in black colour are equal to the above mentioned limits in soils.

3.12. SLOVENIA

Samples were taken from two locations at Sava river:

1. SAVA – JEVNICA, KERSNIŠKE POLJANE – 46.0885, 14.7485; FS- YES, BS-YES, SS-NO;
2. SAVA – MEDNO – 46.1215,14.4416; FS-YES, BS-YES, SS-NO.

All values of the analysed parameters for all samples are below the limit value according to the Slovenian Official Gazette (1996) for soils. Comparing the results of the national laboratory and the reference laboratory, the main difference is in the detection limit for PAHs and pesticides. In the national laboratory, all PAHs and pesticides values were below the limit of detection, so that a comparison was only possible for the metals (Fig. 3.12.1 1 and 3.12.2). As we can see from Fig. 3.12.1, the results are quite comparable with deviations of 1 to 24 %, except for chromium and mercury (Fig. 3.12.2), where we can see deviations of 35 to 56 %.

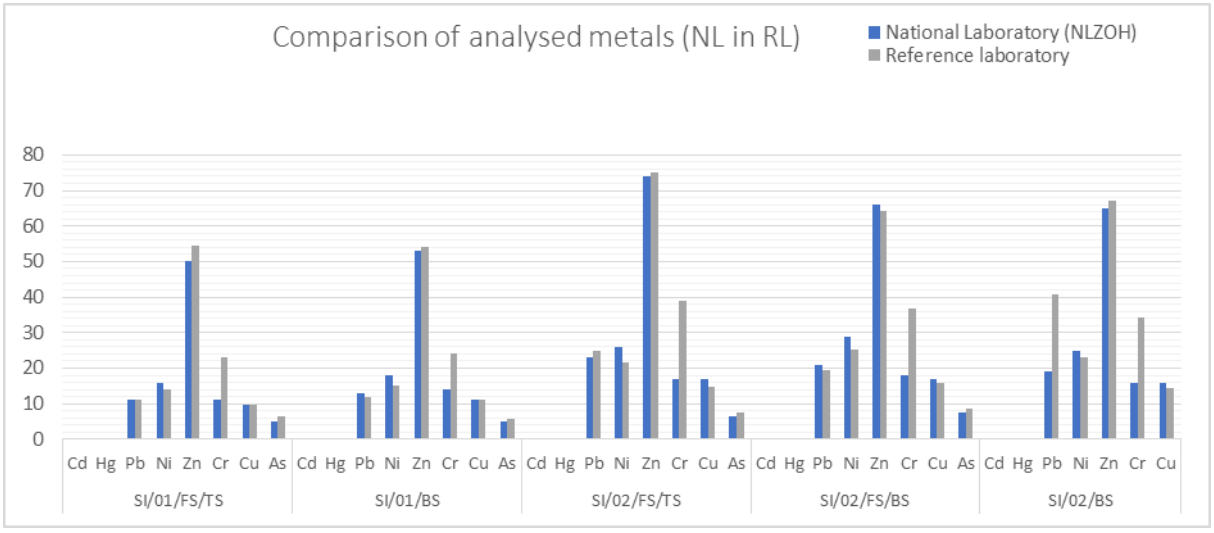


Fig. 3.12.1 Comparison of the analysed metals between the results of the National laboratory and Reference laboratory

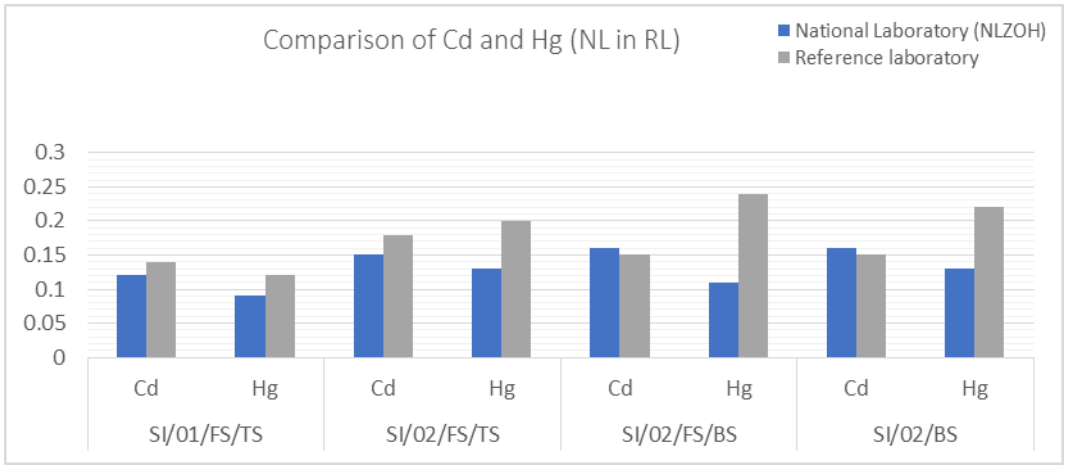


Fig. 3.12.2 Comparison of Cd and Hg between the results of the National laboratory and Reference laboratory

If we compare the different types of sediments, floodplain and bottom, we can see that there are slight variations. In all samples at site 1 the concentrations of the analysed metals are slightly higher in the bottom sediments and in half of the samples at site 2. At site 2, higher values were found for almost all metals, but the values are quite comparable (Fig. 3.12.3 and 3.12.4).

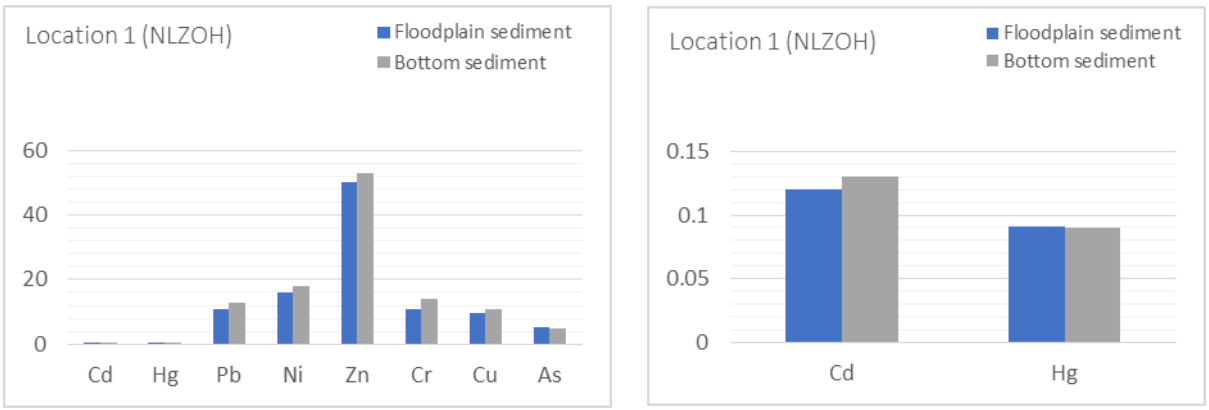


Fig. 3.12.3 Comparison of analysed metals at location 1 (Sava, Kersniške poljane) for floodplain and bottom sediments

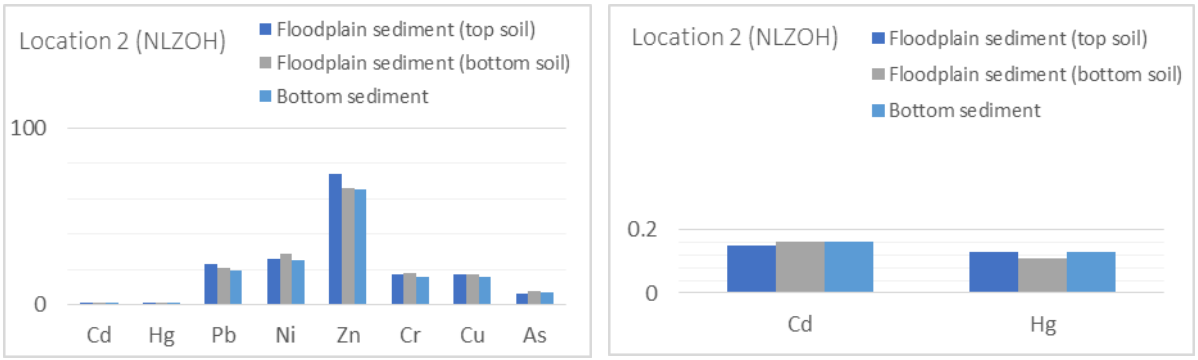


Fig. 3.12.4 Comparison of analysed metals at location 2 (Sava, Medno) for floodplain (top soil, bottom soil) and bottom sediments

As mentioned above, all analysed parameters are below the limit values for soils in Slovenia (see limit values for soils in Table 3.12). The status of the sediments in relation to the evaluation 2/2 in the Excel Tool spreadsheet is good, with most samples classified as not risky. However, some samples are evaluated as risky. Bottom sediments at location 1 and 2 show elevated levels of anthracene and Benzo(a)pyrene according to the official Serbian Gazette of RS. Samples of bottom sediments at location 1 and 2 have higher values for nickel and its compounds regarding Elbe basin (IKSE/ICPER 2018) values and also regarding US EPA at location 2. However, the values for all mentioned parameters are not risky for all samples comparing different QS values. Nickel concentrations can be partly related to the regional geology (Carboniferous-Permian shales and sandstones). The median value for Slovenian soils is 29 mg/kg (Gosar et al., 2019), which is also the value measured at location 2.

Regarding the evaluation 1/2 in the Excel Tool table (DanubeRiverBasinSedimentResults_20211116), some parameters are recognized as bad. Benzo(a)pyrene in the bottom sediments at location 1 and fluoranthene and total PAHs at locations 1 and 2 are evaluated as bad.

As we can see from the assessment results for sediments in Slovenia, bottom sediments are evaluated as riskier than floodplain sediments for total PAHs, Benzo(a)pyrene and Fluoranthene. All these parameters can have a natural or anthropogenic origin. Both locations are located close to the capital (Ljubljana), the location 1 about 20 km northeast of Ljubljana and location 2 at 10 km northwest of Ljubljana. Both sites lie in the area of agricultural land, so the sediments may be anthropogenically influenced. Water quality and ecological status of Sava river at Medvode (near the Medno, location 2) is evaluated as good (ARSO, https://www.arso.gov.si/vode/reke/publikacije%20in%20poro%c4%8dila/Ekolosko_stanje_reke_NUV3.pdf).

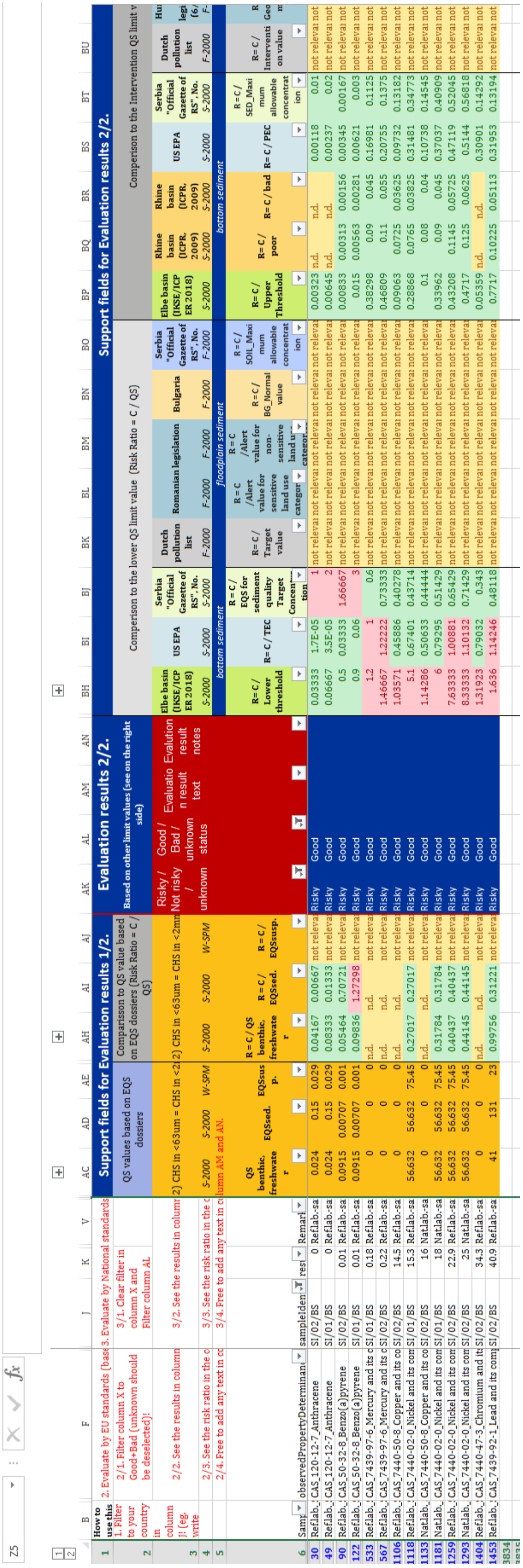
Table 3.12 Limit, warning and critical values for soils in Slovenia (Official Gazette RS, 1996)

PARAMETER	LIMIT SOIL VALUE (mg/kg)	WARNING SOIL VALUE (mg/kg)	CRITICAL SOIL VALUE (mg/kg)
Cd	1	2	12
Cu	60	100	300
Ni	50	70	210
Pb	85	100	530
Zn	200	300	720
Cr	100	150	380
Cr^{6+}			25
Hg	0.8	2	10
Co	20	50	240
Mo	10	40	200
As	20	30	55
fluorides	450	825	1200
volatile phenols	0.1	20	40
benzene	0.05	0.5	1
etilbenzene	0.05	25	50
toluene	0.05	65	130
xylene	0.05	12.5	25
PAH (total)	1	20	40
PCB	0.2	0.6	1
mineral oils	50	2500	5000
atrazine	0.01	3	6
simazine	0.01	3	6

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

Fig. 3.12.1 Substances over the European standards in bottom sediments BS in Slovenia Evaluation 1/2

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



Z5

How to use this: 1. Filter to your country in column J! (eg. write

2. Evaluate by EU standards (base… 2/1. Filter column X to Good+Bad (unknown should be deselected)! 2/2. See the results in column… 2/3. See the risk ratio in the c… 2/4. Free to add any text in co…

3. Evaluate by National standards 3/1. Clear filter in column X and Filter column AL 3/2. See the results in column… 3/3. See the risk ratio in the c… 3/4. Free to add any text in column AM and AN.

Support fields for Evaluation results 1/2. — QS values based on EQS dossiers (2) CHS in <63um = CHS in <2…); Comparisson to QS value based on EQS dossiers (Risk Ratio = C / QS) (2) CHS in <63um = CHS in <2mm)

Evaluation results 2/2. — Based on other limit values (see on the right side)

Row	Samp	observedPropertyDeterminand	sampleIdent	resu	Remark	QS benthic, freshwater (S-2000)	EQSsed. (S-2000)	EQSsusp. (W-SPM)	R = C / QS benthic, freshwater (S-2000)	R = C / EQSsed. (S-2000)	R = C / EQSsusp. (W-SPM)	Risky / Not risky / unknown	Good / Bad / unknown status	Evaluation result text	Evalution result notes
30	Ref.lab._	CAS_120-12-7_Anthracene	SI/02/BS	0	Ref.lab.-sa	0.024	0.15	0.029	0.04167	0.00667	not relevai	Risky	Good		
49	Ref.lab._	CAS_120-12-7_Anthracene	SI/01/BS	0	Ref.lab.-sa	0.024	0.15	0.029	0.08333	0.01333	not relevai	Risky	Good		
90	Ref.lab._	CAS_50-32-8_Benzo(a)pyrene	SI/02/BS	0.01	Ref.lab.-sa	0.0915	0.00707	0.001	0.05464	0.70721	not relevai	Risky	Good		
122	Ref.lab._	CAS_50-32-8_Benzo(a)pyrene	SI/01/BS	0.01	Ref.lab.-sa	0.0915	0.00707	0.001	0.09836	1.27298	not relevai	Risky	Good		
533	Ref.lab._	CAS_7439-97-6_Mercury and its c	SI/01/BS	0.18	Ref.lab.-sa	0	0	0	n.d.	n.d.	not relevai	Risky	Good		
567	Ref.lab._	CAS_7439-97-6_Mercury and its c	SI/02/BS	0.22	Ref.lab.-sa	0	0	0	n.d.	n.d.	not relevai	Risky	Good		
1106	Ref.lab._	CAS_7440-50-8_Copper and its co	SI/02/BS	14.5	Ref.lab.-sa	0	0	0	n.d.	n.d.	not relevai	Risky	Good		
1118	Ref.lab._	CAS_7440-02-0_Nickel and its com	SI/01/BS	15.3	Ref.lab.-sa	56.632	56.632	75.45	0.27017	0.27017	not relevai	Risky	Good		
1133	Nat.lab._	CAS_7440-50-8_Copper and its co	SI/02/BS	16	Nat.lab.-sa	0	0	0	n.d.	n.d.	not relevai	Risky	Good		
1181	Nat.lab._	CAS_7440-02-0_Nickel and its com	SI/01/BS	18	Nat.lab.-sa	56.632	56.632	75.45	0.31784	0.31784	not relevai	Risky	Good		
1259	Ref.lab._	CAS_7440-02-0_Nickel and its com	SI/02/BS	22.9	Ref.lab.-sa	56.632	56.632	75.45	0.40437	0.40437	not relevai	Risky	Good		
1293	Nat.lab._	CAS_7440-02-0_Nickel and its com	SI/02/BS	25	Nat.lab.-sa	56.632	56.632	75.45	0.44145	0.44145	not relevai	Risky	Good		
1404	Ref.lab._	CAS_7440-47-3_Chromium and its	SI/02/BS	34.3	Ref.lab.-sa	0	0	0	n.d.	n.d.	not relevai	Risky	Good		
1453	Ref.lab._	CAS_7439-92-1_Lead and its comp	SI/02/BS	40.9	Ref.lab.-sa	41	131	23	0.99756	0.31221	not relevai	Risky	Good		

Support fields for Evaluation results 2/2. — Comperison to the lower QS limit value (Risk Ratio = C / QS); Comperison to the Intervention QS limit v…

Row	Elbe basin (IKSE/ICPER 2018) S-2000, bottom sediment: R= C / Lower threshold	US EPA S-2000, bottom sediment: R= C / TEC	Serbia "Official Gazette of RS", No. S-2000, bottom sediment: R = C / EQS for sediment quality Target Concentration	Dutch pollution list F-2000, floodplain sediment: R= C / Target value	Romanian legislation F-2000, floodplain sediment: R = C /Alert value for sensitive land use category	Romanian legislation F-2000, floodplain sediment: R = C /Alert value for non-sensitive land use category	Bulgaria F-2000, floodplain sediment: R = C / BG_Normal value	Serbia "Official Gazette of RS", No. F-2000, floodplain sediment: R = C / SOIL_Maximum allowable concentration	Elbe basin (IKSE/ICPER 2018) S-2000, bottom sediment: R= C / Upper Threshold	Rhine basin (ICPR, 2009) S-2000, bottom sediment: R= C / poor	Rhine basin (ICPR, 2009) S-2000, bottom sediment: R= C / bad	US EPA S-2000, bottom sediment: R= C / PEC	Serbia "Official Gazette of RS", No. S-2000, bottom sediment: R = C / SED_Maximum allowable concentration	Dutch pollution list F-2000: R= C / Intervention value	Hu… legi… (6/… F-…: R… Geo… m…
30	0.03333	1.7E-05	1	not relevai	not relevai	not relevai	not relevai	not relevai	0.00323	n.d.	n.d.	0.00118	0.01	not relevai	not
49	0.06667	3.5E-05	2	not relevai	not relevai	not relevai	not relevai	not relevai	0.00645	n.d.	n.d.	0.00237	0.02	not relevai	not
90	0.5	0.03333	1.66667	not relevai	not relevai	not relevai	not relevai	not relevai	0.00833	0.00313	0.00156	0.00345	0.00167	not relevai	not
122	0.9	0.06	3	not relevai	not relevai	not relevai	not relevai	not relevai	0.015	0.00563	0.00281	0.00621	0.003	not relevai	not
533	1.2	1	0.6	not relevai	not relevai	not relevai	not relevai	not relevai	0.38298	0.09	0.045	0.16981	0.1125	not relevai	not
567	1.46667	1.22222	0.73333	not relevai	not relevai	not relevai	not relevai	not relevai	0.46809	0.11	0.055	0.20755	0.1375	not relevai	not
1106	1.03571	0.45886	0.40278	not relevai	not relevai	not relevai	not relevai	not relevai	0.09063	0.0725	0.03625	0.09732	0.13182	not relevai	not
1118	5.1	0.67401	0.43714	not relevai	not relevai	not relevai	not relevai	not relevai	0.28868	0.0765	0.03825	0.31481	0.34773	not relevai	not
1133	1.14286	0.50633	0.44444	not relevai	not relevai	not relevai	not relevai	not relevai	0.1	0.08	0.04	0.10738	0.14545	not relevai	not
1181	6	0.79295	0.51429	not relevai	not relevai	not relevai	not relevai	not relevai	0.33962	0.09	0.045	0.37037	0.40909	not relevai	not
1259	7.63333	1.00881	0.65429	not relevai	not relevai	not relevai	not relevai	not relevai	0.43208	0.1145	0.05725	0.47119	0.52045	not relevai	not
1293	8.33333	1.10132	0.71429	not relevai	not relevai	not relevai	not relevai	not relevai	0.4717	0.125	0.0625	0.5144	0.56818	not relevai	not
1404	1.31923	0.79032	0.343	not relevai	not relevai	not relevai	not relevai	not relevai	0.05359	n.d.	n.d.	0.30901	0.14292	not relevai	not
1453	1.636	1.14246	0.48118	not relevai	not relevai	not relevai	not relevai	not relevai	0.7717	0.10225	0.05113	0.31953	0.13194	not relevai	not

Fig. 3.12.2 Substances over other national standards in bottom sediments BS in Slovenia Evaluation 2/2

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

REFERENCES

Canadian Council of Ministers of the Environment, 2010, Canadian soil quality guidelines for potentially carcinogenic and other PAHs: Scientific criteria document. CCME, Winnipeg.

Dudás K.M. Jordan G., the SIMONA Project Team, 2021, Sediment quality evaluation protocol for HSs in surface waters. EU Interreg Danube Transnational Programme, 61 p.

Gosar, M., Šajn, R., Bavec, Špela, Gaberšek, M., Pezdir, V., & Miler, M. 2019, Geochemical background and threshold for 47 chemical elements in Slovenian topsoil. Geologija, 62(1), 7–59. https://doi.org/10.5474/geologija.2019.001

Shafy H., Mansour M.S.M., 2016, A review on polycyclic aromatic hydrocarbons: Source, environmental impact, effect on human health and remediation. Egyptian Journal of Petroleum, 25.