

QUESTIONNAIRE FOR EXISTING SAMPLING, LABORATORY AND EVALUATION METHODS

0.0. State your institution and country.

Institution: Geological survey of Federation of Bosnia and Herzegovina

Country: Bosnia and herzegovina

0.1. State institution(s) from which you got data to fill this questionnaire.

- Federal Institute for Agropedology,
- Federal Institute for Agriculture,
- Sava River Basin Agency

I. LEGISLATIVE FRAMEWORK

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

No	Title (in Bosnian language)	Title (in English)	Link	Country
1	("Službene novine Federacije Bosne i Hercegovine" broj 33/03, 38/09) "Zakon o zaštiti okoliša"	("Official Newspapers of Federation of B&H" No 33/03, 38/09) „Law on Environmental Protection“	http://extwprlegs1.fao.org/docs/pdf/bih130990.pdf	BA
2	("Službene novine Federacije BiH" broj 52/09) "Zakon o poljoprivrednom zemljištu"	("Official Newspapers of Federation of B&H" No 52/09) "Law on Agricultural Land"	https://advokat-prnjavorac.com/zakoni/Zakon-o-poljoprivrednom-zemljištu-FBiH.pdf	BA
3	("Službene novine Federacije BiH" broj 72/09) "Pravilnik o utvrđivanju dozvoljenih količina štetnih i opasnih materija u zemljištu i metode njihovog ispitivanja"	("Official Newspapers of Federation of B&H" No 72/09) "Regulations on establishing the validity of the quantity of damaged and dangerous materials in	http://www.fuzip.gov.ba/bundles/websitene/ws/gallery/files/116/1496150694100_Pravilnik_o_utvrđivanju_dozvoljenih_količina_štetnih_i_opasnih_materija_u_zemljištu_i_metode_njihovog_iskitivanja	BA

		the land and the methods of their examination“		
4	(“Službeni glasnik Bosne i Hercegovine” broj 26/10) “Pravilnik o prirodnim mineralnim i prirodnim izvorskim vodama”	(“Official Gazette of Bosnia and Herzegovina“ No 26/10) „Ordinance on natural mineral and natural spring waters“	http://www.fsa.gov.ba/fsa/images/pravni-propisi/bs-Pravilnik_o_prirodnim_mineralnim_i_prirodnim_izvorskim_vodama_26-10.pdf	BA
5	(“Službeni glasnik Bosne i Hercegovine” broj 40/10, 43/10, 30/12) “Pravilnik o zdravstvenoj ispravnosti vode za piće”	(“Official Gazette of Bosnia and Herzegovina“ No 40/10, 43/10, 30/12) „Ordinance on the health of drinking water“	http://www.fsa.gov.ba/fsa/images/pravni-propisi/hr-Pravilnik_o_zdravstvenoj_ispravnosti_vode_za_pi%C4%87e_40-10.pdf	BA
6	(“Službeni glasnik Bosne i Hercegovine” broj 26/10) “Pravilnik o prirodnim mineralnim i prirodnim izvorskim vodama”	(“Official Gazette of Bosnia and Herzegovina“ No 26/10) „Ordinance on natural mineral and natural spring waters“	http://www.fsa.gov.ba/fsa/images/pravni-propisi/bs-Pravilnik_o_prirodnim_mineralnim_i_prirodnim_izvorskim_vodama_26-10.pdf	BA
7	(“Službene novine Federacije BiH” broj 70/06) “Zakon o vodama”	(“Official Newspapers of Federation of B&H” No 70/06) “Water Law”	http://www.voda.ba/zakoni/47bos.pdf	BA
8	(“Službene novine Federacije BiH” broj 33/03) “Zakon o zaštiti zraka ”	(“Official Newspapers of Federation of B&H” No 33/03) “Law on Air Protection“	http://www.fzofbih.org.ba/userfiles/file/Zakon%20o%20zastiti%20zraka.pdf	BA
9	(“Službene novine Federacije BiH” broj 4/12)	(“Official Newspapers of Federation of B&H” No 4/12)	http://www.fuzip.gov.ba/bundles/websitene/ws/gallery/files/117/149725598230_Uredba_o_uslovima_isku%C5%A1tanja_otpadnih_voda_u_okoli%C5%A1_i_sisteme_javne	BA

	“Uredba o uvjetima ispuštanja otpadnih voda u prirodne recipijente I sustav javne kanalizacije”	“Regulation on Conditions for Discharging Wastewater into Natural Recipients and Public sewer system“	kanalizacije (Slu%C5%BEbene novine FBiH , broj 101 15).pdf	
10	(“Službene novine Federacije BiH” broj 43/07) “Uredba o štetnim I opasnim materijama u vodama”	(“Official Newspapers of Federation of B&H” No 4/12) "Regulation on Harmful and Hazardous Substances in Waters",	http://www.fbihvlada.gov.ba/bosanski/zakoni/2007/uredbe/18.htm	BA
11	(“Službene novine Federacije BiH” broj 50/07) “Pravilnik o graničnim vrijednostima opasnih I štetnih materija za tehnološke otpadne vode prije njihovog ispuštanja u system javne kanalizacije, odnosno drugi prijemnik”	(“Official Newspapers of Federation of B&H” No 50/07) "Ordinance on Limits of Hazardous and Noxious Substances for Technological Waste Water Prior to Their Discharge into the Public Sewerage System, ie another Receiver",	http://www.voda.ba/zakoni/25_56_b.pdf	BA

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

Alert threshold = concentrations of pollutants in air, water, soil or in emissions/discharges, which, when reached, warn the competent authorities on a potential impact on environment and trigger an additional monitoring and/or reduction of pollutant concentrations in emissions/discharges.

Intervention threshold = concentrations of pollutants in air, water, soil or in emissions/discharges, which, when reached, determine the competent authorities to order risk assessment studies and reduction of pollutant emissions from emissions/discharges.

Each country, please deliver the definition of specific terms in the respective law.

Table 1 Metal trace elements in soils - according to the regulations of the Federation of Bosnia and Herzegovina (“Regulations on establishing the validity of the quantity of damaged and dangerous materials in the land and the methods of their examination“)

Trace Element	Levels in soils (mg/kg)		
Metals	Limit values (depending on the texture of the soil)		
	Sandy soil	Clayey silt soil	Clay soil
Hg	0,5	1	1,5
As	10	15	20
Cd	0,5	1	1,5
Cr	50	80	100
Cu	50	65	80
Ni	30	40	50
Pb	50	80	100
Zn	100	150	200

Table 2 Metal trace elements in surface waters - according to the regulations of the Federation of Bosnia and Herzegovina (“The maximum permissible concentrations of certain hazardous substances in surface waters”)

Trace Element	Levels in surface waters (µg/l)	
metals	I and II classes of surface waters	III and IV classes of surface waters
Hg	0,02	1,00
As	50	50
Cd	0,5	5,0
Cr	1-6	6-20
Cu	2-10	10-20
Pb	2	80
Zn	50-80	80-200
Ti	100	100
V	100	200
Se	10	10
Mo	500	500
TI	3	30

Table 3 Limit values of Metal trace elements in drinking waters - according to the regulations of the Federation of Bosnia and Herzegovina

Trace Element (metals)	Unit of measurement	Levels in drinking waters
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Hg	mg/l	0,001
As	mg/l	0,01
Cd	mg/l	0,005
Cr	mg/l	0,05
Cu	mg/l	2
Ni	mg/l	0,02
Pb	mg/l	0,01
Zn	mg/l	-
Al	mg/l	0,2
Sb	mg/l	0,005
Mn	µg/l	50
Na	mg/l	200
Fe	g/l	200

Table 4 Non-metal trace elements in soils - according to the regulations of the Federation Bosnia and Herzegovina (“Regulations on establishing the validity of the quantity of damaged and dangerous materials in the land and the methods of their examination“)

Trace Element	Levels in soils (mg/kg)		
	Sandy soil	Clayey silt soil	Clay soil
F	150	250	350
Cl			
S	300	400	500
Br			
I			

Table 5 Non-metal trace elements in surface waters - according to the regulations of the Federation of Bosnia and Herzegovina (“The maximum permissible concentrations of certain hazardous substances in surface waters“)

Trace Element	Levels in surface waters (µg/l)	
	I and II classes of surface waters	III and IV classes of surface waters
F		
Cl		
S		
Br		
I		

Table 6 Limit values of non-metals trace elements in drinking waters - according to the regulations of the Federation of Bosnia and Herzegovina

Trace Element (non-metals)	Unit of measurement	Levels in drinking waters
B	mg/l	1
Cl	mg/l	250
Se	mg/l	0,01
F		
S		
Br		

Please complete the list of HSs according to national documents with:

- Table of Polycyclic Aromatic Hydrocarbons –PAHs,
- Table of Polychlorinated Biphenyls-PCBs,
- Table of microbiological parameters, as well as other parameters that are provided in national legislations

Table 7 Limit values of organic pollutants in the soil - according to the regulations of the Federation of Bosnia and Herzegovina

Organic harmful and hazardous substances	Limit values (mg/kg)
The Total concentration of Polycyclic Aromatic Hydrocarbons - PAHs	2
The Total concentration of Polychlorinated Biphenyls - PCBs	0,2
Insecticides based on Chlorinated Hydrocarbons	
DDTs/DDDs/DDEs (Total concentration = DDTs+DDDs+DDEs)	0,1
Drins (Total concentration = aldrins + diealdrins + endrins)	0,1
HCH compounds (Total concentration = alpha-HCH + beta-HCH + gamma-HCH + delta-HCH)	0,1
Other plant protection products	
Antrazin	0,01
Simazin	0,01

Table 8 Limit values of Hazardous and Harmful Substances in drinking waters - according to the regulations of Bosnia and Herzegovina

Hazardous and Harmful Substances	Unit of measurement	Levels in surface waters
Acrylamide	µg/l	0,10
Ammonia NH ₄ ⁺	mg/l	0,50
Benzene	µg/l	1,0

Bromate	µg/l	10
Cyanide	µg/l	50
1,2-Dichloroethane	µg/l	3,0
Epichlorohydrin	µg/l	0,10
Fluoride	mg/l	1,5
Chlorides	mg/l	250
Nitrate	mg/l	50
Nitrite	mg/l	0,5
Pesticide/Individually	µg/l	0,1
Pesticide/Total	µg/l	0,5
Sulphate	mg/l	250
Total/Tetrachloroethane + Trichloroethane	µg/l	10
THMs/Total	µg/l	100
Vinyl Chloride	µg/l	0,50

Table 9 Maximum permissible concentrations of certain hazardous substances in surface waters - according to the regulations of Federation of Bosnia and Herzegovina

Hazardous and Harmful Substances	I and II classes of surface (µg/l)	III and IV classes of surface waters (µg/l)
Tributyl Tin compounds (total)	0,001	0,005
Triphenyl Tin compounds (total)	0,001	0,005
Cyanide	1	100
3,4-benzo (a) pyrene	0,005	0,01
3,4-benzo (b) fluorantene	0,005	0,01
Polycyclic aromatic hydrocarbons (PAH) are total	0,2	1
Chloroform	2	10
Tetrachloride carbon	2	10
1,2-dichloroethane	5	10
Trichloroethane	5	10
Trichlorethylene	5	10
Tetrachlorethylene	5	10
Trichlorobenzene	0,1	0,4
Dichloromethane	2	20
Bromodichlormethane	2	20
Bromoform	2	20
Hexachlorethane	6	10
Vinyl Chloride	1	2
Dichloroethylene	1,5	25
Monochlorbenzene	20	100
Dichlorobenzene	2	20

Tetrachlorbenzene	1	2
Dichloropropane	50	200
Dichloropropene	1	20
Hexachlorebutadiene	0,01	0,1
Endosulfan	0,03	0,03
Endrin	0,001	0,005
Drins (aldrin+dieldrin+endrin)	0,03	0,03
DDT (total)	0,005	0,050
Heptachlor	0,001	0,001
Chlordane	0,01	0,1
Methoxychlorine	0,03	0,3
Toxaphene	0,005	0,05
Polychlorinated biphenyls (PCBs) (total)	0,02	0,20
Phenols (total)	5	25
Aminophenols	10	50

1.3 Quality objectives for hazardous substances (please complete the tables of HSs according to national documents)

Table 10

Dangerous substance (HS)	Water quality objective ($\mu\text{g/l}$)	Quality target for sediment (mg/kg)	Quality objective for biocenosis (mg/kg)
Cd	5	-	-mollusks (as far as possible Mytilus edulis) and fish.
Hg	1.0	-	0.3 mollusks and fish

1.4 Listing of analytical standards (national analytics and international e.g. USEPA, ASTM, etc.) recommended in documents for chemical, physical, microbiological analyzes of samples

Table 11 Specific substances of contamination with method of determination

Arsenic	Standard Methods 3113-B, APHA-AWWA-WEF 2005.
Copper	Standard Methods 3113-B, APHA-AWWA-WEF 2005.
Chromium	BAS ISO 9174
Zinc	Standard Methods 3113-B, APHA-AWWA-WEF 2005

Table 12 List of priority substances with method of determination

Alachlor	EPA 525.2:1994
Anthracene	EPA 550.1
Atrazine	EPA 525.2:1994
Benzene	BAS EN ISO 11423-2:2003
Cadmium and its compounds	Standard Methods 3113-B, issued by APHA-AWWA-WEF 2005
Chlorfenvinphos	EPA 525.2:1994
Chlorpyrifos	EPA 525.2:1994
Aldrin	EPA 508.1:1994
Dieldrin	
Endrin	
DDT total	EPA 508.1:1994
Para-para-DDT	EPA 508.1:1994
1,2-dichloroethane	StaticHeadspace/GC/Theory &Practice
Dichloromethane	StaticHeadspace/GC/Theory &Practice
Di(2-ethylhexyl) phthalate	EPA 525.2:1994
Diuron	BAS EN ISO 11369:2002
Endosulfan	EPA 508.1:1994
Fluoranthene	EPA 550.1
Hexachlorbenzene	EPA 525.2:1994
Hexachlorbutadiene	EPA 525.2
Hexachlorocyclohexane	
gamma isomer, Lindane	EPA 508.1:1994
Izoproturon	BAS EN ISO 11369:2002
Lead	Standard Methods 3113-B, izdat od strane APHA-AWWA-WEF 2005.
Mercury	AMA 254, Advanced Mercury Analyser, Operating Manual
Naphtalene	EPA 550.1
Nickel	Standard Methods 3113-B, izdat od strane APHA-AWWA-WEF 2005.
Nonilphenols	EPA 8040
Octylphenol	EPA 8040
Pentachlorobenzene	BAS EN ISO 6468:2000
Pentachlorophenol	EPA 525.2:1994

PAHs	
Benzo(a)pyrene	EPA 550.1:1994
Benzo(b)fluoranthene	EPA 550.1:1994
Benzo(g, h, i)perylene	EPA 550.1:1994
Benzo(k)fluoranthene	EPA 550.1:1994
Indeno(1,2,3-CD)pyrene	EPA 550.1:1994
Simazine	EPA 525.2:1994
Trichloromethane	StaticHeadspace/GC/Theory &Practice
Trifluralin	EPA 525.2:1994

Table 13

Element	National analytical standards					International analytical standards			"in-house" developed methods"		
Mercury (Hg) in drinking water						USEPA-Method 245.1.					
Mercury (Hg) in solids samples (sediments)						-EPA Method 7473 -U.S. EPA Method 245.5(CVAAS) -ASTM D6722 - thermal decomposition * -ASTM D6414-99 (wet digestion)					
Etc.											

*ASTM=American Society for Testing and Materials

Table 14 Methods and standards for the detection of bacteria in sludge

Title (National language)	Metoda	Title (Eng)	Methods	Standard
Karakterizacija mulja – Detekcija i brojanje Escherichia coli u mulju, tlu, sredstvima za obogaćivanje tla, medijima za rast i biootpadu – Dio 1	Metoda membranske filtracije za kvantifikaciju	Characterization of sludges - Detection and enumeration of Escherichia coli in sludges, soils, soil improvers, growing media and biowastes - Part 1	Membrane filtration method for quantification	BAS CEN/TR 15214-1:2012
Karakterizacija mulja – Detekcija i brojanje Escherichia coli u mulju, tlu, sredstvima za obogaćivanje tla, medijima za rast i biootpadu – Dio 2	Mikro metoda (najvjerojatnijeg broja) pomoću inokulacije u vodenom mediju	Characterization of sludges - Detection and enumeration of Escherichia coli in sludges, soils, soil improvers, growing media and biowastes - Part 2	Miniaturised method (Most Probable Number) by inoculation in liquid medium	BAS CEN/TR 15214-2:2012
Karakterizacija mulja – Detekcija i brojanje Escherichia coli u mulju, tlu, sredstvima za obogaćivanje tla, medijima za rast i biootpadu – Dio 3	Makrometoda (najvjerojatnijeg broja) u vodenom mediju	Characterization of sludges - Detection and enumeration of Escherichia coli in sludges, soils, soil improvers, growing media and biowastes - Part 3	Macromethod (Most Probable Number) in liquid medium	BAS CEN/TR 15214-3:2012
Karakterizacija mulja – Detekcija i brojanje Salmonella spp. u mulju, tlu, sredstvima za obogaćivanje tla, medijima za rast i	Metoda membranske filtracije za kvantitativno oživljavanje bakterija pod subletalnim stresom (radi potvrde)	Characterization of sludges - Detection and enumeration of Salmonella spp. in sludges, soils, soil improvers, growing media and biowastes - Part 1	Membrane filtration method for quantitative resuscitation of sub-lethally stressed bacteria (to confirm)	BAS CEN/TR 15215-1:2012

biootpadu – Dio 1				
Karakterizacij a mulja – Detekcija i brojanje Salmonella spp. u mulju, tlu, sredstvima za obogaćivanje tla, medijima za rast i biootpadu – Dio 2	Metoda tekućim obogaćivanjem u selenit-cistin mediju praćena Rapport- Vassiliadis reagensom za određivanje	Characterizatio n of sludges - Detection and enumeration of Salmonella spp. in sludges, soils, soil improvers, growing media and biowastes - Part 2	Liquid enrichment method in selenite-cystine medium followed by Rapport- Vassiliadis for semi-quantitat	BAS CEN/TR 15215- 2:2012
Karakterizacij a mulja – Detekcija i brojanje Salmonella spp. u mulju, tlu, sredstvima za obogaćivanje tla, medijima za rast i biootpadu – Dio 3	Metoda prisustva/odsustv a uz pomoć obogaćivanja u pepton- novobiocin mediju praćeno Rapport- Vassiliadis re	Characterizatio n of sludges - Detection and enumeration of Salmonella spp. in sludges, soils, soil improvers, growing media and biowastes - Part 3	Presence/absenc e method by liquid enrichment in peptone- novobiocin medium followed by Rapport- Vassiliadis re	BAS CEN/TR 15215- 3:2012

I.5. List of chronic or acute toxicity tests and determination of bioaccumulation or persistence in biota according to the specificity of the dangerous substance in the trophic chain (Ex: Microtox test - The potential ecological impacts of anaerobic degradation of vegetable oil on freshwater sediments; Hyalella Azteca etc).

I.6 List of national, and international guides of techniques on the design of sampling, transport, storage, samples preparation (sieving, fraction extraction, separation, etc.) recommended in documents.

Table 15

No		sediment	soil	water
1	Sampling design, sampling, transport, storage			BAS EN 5667-1:2008 BAS ISO 5667-3:2005 BAS ISO 5667-6:2000

I.7 Specify the recommended remedy measures associated with the contents of the hazardous substances (alert threshold, intervention threshold)

II PRACTICES, EXPERIENCES

II.1. Significant national, European, finalized or ongoing projects related to geochemistry of waters, soils, sediments in the Danube basin

Table 16

No.	Project title (national language, if available)	Project Title (EN)	Year	Country	Project coordinators, Partners
1	GEMAS	GEMAS (Geochemical mapping of Agricultural Soils of Europe)	2008-2012	BA	All European countries
2	PCB	PCB	2004	BA	

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

Table 17

No.	Paper title (national language, if available)	Title (EN)	Year	Country	Authors
1	Sadržaj nikla,	The content of	2015.	BA	Trako Ejub

	hroma, žive i arsena u poplavljenim područjima općine Maglaj	nickel, chromium, mercury and arsenic in the flooded areas of the municipality of Maglaj			and all.
2.	Izveštaj o stanju poljoprivrednog zemljišta Federacije Bosne i Hercegovine nakon majskih-avgustovskih poplava 2014. godine	Report on the state of agricultural land of the Federation of Bosnia and Herzegovina after the May and August floods in 2014	2015	BA	Federal Institute for Agropedology
3.	Teški metali u okolišu	Heavy metals in the environment	2005	BA	Goletić, Š.

II.3 Existent waterbodies and sampling sites (Ramsar, Natura2000 etc.) and current quality monitoring stations of the Danube River

Table 18 Danube River Quality Monitoring Stations in federation of Bosnia and Herzegovina (Drinking waters)

No.	Site			Country
	Water body (underground)	Spring	Monitoring Station	BA
1.	Plješevica	Klokot	Klokot	BA
2.	Vlašić	Plava voda	Travnik	BA
3.	Igman-Bjelašnica	Vrelo Bosne	Ilidža	BA
4.	Grmeč	Krušnica	Krušnica	BA
5.	Grmeč	Zdena	Zdena	BA

Table 19 Danube River Quality Monitoring Stations in Federation of Bosnia and Herzegovina – coordinates (Drinking waters)

No	Site coordinates (North, East) in WGS84 system (at least seven decimals)	Project title (national language)	Project title (EN)	Year	Country	Obs.(type of analysis, purpose of monitoring, sampling rate)

	points)					
1.	44,823679° 15,804527°	Monitoring pitkih voda (uspostavljen)	Drinking water monitoring (established)		BA	
2.	44,230697° 17,671648°	Monitoring pitkih voda (uspostavljen)	Drinking water monitoring (established)		BA	
3.	43,818342° 18,268653°	Monitoring pitkih voda (uspostavljen)	Drinking water monitoring (established)		BA	
4.	44,845269° 16,170238°	Monitoring pitkih voda (djelimično uspostavljen)	Drinking water monitoring (partially established)			
5.	44,762085° 16,628955°	Monitoring pitkih voda (djelimično uspostavljen)	Drinking water monitoring (partially established)			

Table 20 Danube River Basin Monitoring Stations in Federation of Bosnia and Herzegovina (Surface waters)

No	Site Coordinates	River	Monitoring Station	Municipality	Project Title	Country
Sava						
1.	45°08'07" 18°14'33"	Sava - kanal	Svilaj	Domaljeva c-Šamac	Surface water Monitoring	BA
2.	45°06'11" 18°23'02"	Zorice - kanal	Zorice - kanal	Domaljeva c-Šamac	Surface water Monitoring	BA
3.	45°02'35" 18°32'04"	Sava	Grebnice	Orašje	Surface water Monitoring	BA
4.	45°03'31" 18°37'21"	Tolišnica - kanal	Tolisa	Orašje	Surface water Monitoring	BA
5.	45°02'10" 18°42'00"	Sava	Orašje	Orašje	Surface water Monitoring	BA
6.	44°42'26" 18°29'09"	Tinja	Srebrenik	Srebrenik	Surface water Monitoring	BA
Una						

1.	44°22'51" 16°22'59"	Unac	Drvar	Drvar	Surface water Monitoring	BA
2.	44°29'36" 16°08'31"	Unac	Rmanj	Drvar	Surface water Monitoring	BA
3.	44°29'44" 16°08'05"	Una	Martin Brod	Bihać	Surface water Monitoring	BA
4.	44°33'45" 16°33'45"	Una	Kulen Vakuf	Bihać	Surface water Monitoring	BA
5.	44°46'20" 15°26'54"	Una	Ripač	Bihać	Surface water Monitoring	BA
6.	44°48'49" 15°52'16"	Una	Bihać	Bihać	Surface water Monitoring	BA
7.	44°50'04" 15°50'45"	Una	Kralje	Bihać	Surface water Monitoring	BA
8.	44°52'51" 15°53'40"	Una	Kostela	Bihać	Surface water Monitoring	BA
9.	44°53'04" 16°09'11"	Una	Bosanska Krupa	Bosanska Krupa	Surface water Monitoring	BA
10.	44°57'32" 16°10'54"	Una	Bosanska Otoka	Bosanska Krupa	Surface water Monitoring	BA
11.	44°31'32" 16°47'45"	Sana	Ključ	Ključ	Surface water Monitoring	BA
12.	44°45'59" 16°39'59"	Sana	Sanski Most	Ključ	Surface water Monitoring	BA
13.	44°37'01" 16°39'32"	Sanica	Sanica	Ključ	Surface water Monitoring	BA
14.	44°40'51" 16°44'01"	Sana	Hrustovo	Sanski Most	Surface water Monitoring	BA
15.	44°46'18" 16°38'39"	Bliha	Bliha	Sanski Most	Surface water Monitoring	BA
Kupa						
1.	44°59'41" 15°47'15"	Mutnica	Tržac	Cazin	Surface water Monitoring	BA

2.	45°10'48" 15°49'28"	Kladušank a	Velika kladuša	Velika Kladuša	Surface water Monitoring	BA
Vrbas						
1.	43°56'25" 17°35'03"	Vrbas	Gornji Vakuf	Gornji Vakuf	Surface water Monitoring	BA
2.	44°03'37" 17°27'46"	Vrbas	Bugojno na Vrbasu	Bugojno	Surface water Monitoring	BA
3.	44°07'45" 17°24'08"	Vrbas	Daljan	Donji Vakuf	Surface water Monitoring	BA
4.	44°20'23" 17°16'25"	Vrbas	Kozluk	Jajce	Surface water Monitoring	BA
5.	43°57'22" 17°34'05"	Bistrica	Bistrica	Gornji Vakuf	Surface water Monitoring	BA
6.	44°03'10" 17°27'13"	Veseočica	Veseočica	Bugojno	Surface water Monitoring	BA
Bosna						
1.	45°50'03" 18°17'11"	Bosna	Rimski most	Ilidža	Surface water Monitoring	BA
2.	43°50'22" 18°17'10"	Bosna	Otes	Ilidža	Surface water Monitoring	BA
3.	43°50'40" 18°17'02"	Bosna	Osjek	Ilidža	Surface water Monitoring	BA
4.	43°51'44" 18°16'52"	Bosna	Butile na Bosni	Ilidža	Surface water Monitoring	BA
5.	43°57'55" 18°15'25"	Bosna	Ljubinići	Ilijaš	Surface water Monitoring	BA
6.	43°59'26" 18°10'58"	Bosna	Visoko na Bosni	Visoko	Surface water Monitoring	BA
7.	44°07'24" 18°06'44"	Bosna	Kakanj na Bosni	Kakanj	Surface water Monitoring	BA
8.	44°11'26" 17°55'41"	Bosna	Raspotočje	Kakanj	Surface water Monitoring	BA
9.	44°15'22" 17°53'00"	Bosna	Vranduk uzvodno	Zenica	Surface water	BA

					Monitoring	
10.	44°18'32" 17°54'09"	Bosna	Vranduk nizvodno	Zenica	Surface water Monitoring	BA
11.	44°25'26" 18°01'28"	Bosna	Žepče	Žepče	Surface water Monitoring	BA
12.	44°26'24" 18°08'37"	Bosna	Zavidovići na Bosni	Zavidovići	Surface water Monitoring	BA
13.	44°31'48" 18°06'24"	Bosna	Donji Ulišnjak	Maglaj	Surface water Monitoring	BA
14.	44°32'49" 18°06'07"	Bosna	Maglaj Grad	Maglaj	Surface water Monitoring	BA
15.	44°33'54" 18°05'57"	Bosna	Maglaj	Maglaj	Surface water Monitoring	BA
16.	44°37'19" 18°05'55"	Bosna	Kosova	Maglaj	Surface water Monitoring	BA
17.	45°03'54" 18°27'44"	Bosna	Šamac	Šamac	Surface water Monitoring	BA
18.	43°49'31" 18°18'32"	Željeznica	Ilidža	Ilidža	Surface water Monitoring	BA
19.	43°50'26" 18°15'33"	Zujevina	Blažuj	Ilidža	Surface water Monitoring	BA
20.	43°51'09" 18°23'36"	Miljacka	Vodoprivred a	Novo Sarajevo	Surface water Monitoring	BA
21.	43°55'14" 18°19'01"	Ljubin	Semizovac	Semizova c	Surface water Monitoring	BA
22.	43°56'58" 18°15'29"	Misoča	Ilijaš	Ilijaš	Surface water Monitoring	BA
23.	43°57'51" 17°53'59"	Dragača	Fojnica	Fojnica	Surface water Monitoring	BA
24.	44°06'02" 18°07'51"	Trstionica	Obre	Kakanj	Surface water Monitoring	BA
25.	44°07'41" 18°06'59"	Zgošća	Kakanj na Zgošći	Kakanj	Surface water Monitoring	BA

26.	44°13'33" 17°39'27"	Lašva	Travnik	Travnik	Surface water Monitoring	BA
27.	44°08'04" 17°55'22"	Lašva	Merdan	Zenica-Busovača	Surface water Monitoring	BA
28.	43°58'36" 18°14'43"	Stavnica	Podlugovi	Ilijaš	Surface water Monitoring	BA
29.	43°59'03" 18°10'57"	Fojnica	Visoko na Fojnici	Visoko	Surface water Monitoring	BA
30.	44°26'15" 18°09'56"	Krivaja	Zavidovići na Krivaji	Zavidovići	Surface water Monitoring	BA
31.	44°31'35" 18°05'39"	Lješnica	Lješnica	Maglaj	Surface water Monitoring	BA
32.	44°40'41" 18°01'11"	Usora	Tešanjka	Tešanj-Usora	Surface water Monitoring	BA
33.	44°38'48" 17°54'14"	Usora	Kaloševići	Tešanj	Surface water Monitoring	BA
34.	44°42'16" 18°03'55"	Usora	Karuše	RS	Surface water Monitoring	BA
35.	44°41'46" 18°16'25"	Spreča	Karanovac	Gračanica	Surface water Monitoring	BA
36.	44°07'34" 18°34'28"	Krivaja	Olovo	Olovo	Surface water Monitoring	BA
37.	44°19'08" 18°25'58"	Krivaja	Maoča	Zavidovići	Surface water Monitoring	BA
38.	44°28'07" 18°37'45"	Spreča	Strašanj	Živinice	Surface water Monitoring	BA
39.	44°30'43" 18°30'37"	Spreča	Modrac	Lukavac	Surface water Monitoring	BA
40.	44°25'23" 18°37'46"	Oskova	Donja Višća	Živinice	Surface water Monitoring	BA
41.	44°25'23" 18°37'16"	Gostelja	Živinice	Živinice	Surface water Monitoring	BA
42.	44°30'48"	Turija	Turija	Lukavac	Surface	BA

	18°25'50"				water Monitoring	
Drina						
1.	43°40'00" 18°58'24"	Drina	Goražde	Goražde	Surface water Monitoring	BA
2.	43°34'55" 18°47'29"	Kolunska rijeka	Kolina	Ustikolina	Surface water Monitoring	BA
3.	43°46'01" 18°45'52"	Prača	Prača	Prača	Surface water Monitoring	BA
4.	44°13'33" 18°41'20"	Drinjača	Kladanj	Kladanj	Surface water Monitoring	BA

II.4.Data and metadata availability (including information on ambient or natural concentrations of HSs for establishing intervention measures)

The list of past or current economic polluters referring to the direct effect on the quality of sediment in the Danube (the HSs whose possible concentrations are likely to be exceeded), information on the HSs biological effects, evidence of impact of anthropogenic activities.

II.5.Problems of current monitoring procedures in DRB

III. INVENTORY OF SAMPLING METHODOLOGIES

Sampling and further procedures are done according to ISO 5667 norms.

III.1. Water

III.1.1. Sampling design strategy. How do you choose sampling locations, number of sites, sampling position within the national Danube sector, distance from confluence points, distance from point industry/agriculture polluters, distance from big cities, sampling depth, distance from the water course/bodies banks? How do you decide about temporal frequency of collecting samples?

Sampling locations for trend analysis: upstream/downstream of the country border, near the confluence points of bigger streams, downstream of larger contamination sources.

Sampling locations for ecological and chemical status of certain water bodies and sampling locations for background concentrations are situated at specific locations, different from those for trend monitoring.

III.1.2. Which parameters of water **quality/quantity** are measured *in situ*?

Temperature, pH, dissolved oxygen and electroconductivity.

III.1.3. Which **instruments** are used for *in situ* measurements (include manufacturer and type)?

III.1.4. Please, describe **methodology** for *in situ* measurements.

Temperature – Standard Methods 2550 B, issued by APHA-AWWA-WEF, 2005

Dissolved oxygen – EN ISO 25814:2014

pH – BAS ISO 10523:2013

Electroconductivity – EN 27888:2002.

III.1.5. Which **tools** are used for collecting samples for **laboratory** measurements (include manufacturer and type)?

III.1.6 Sample preservation (samples chemical preservation according to their type and used analysis method).

III.1.7 Please, describe a **methodology** for collecting samples

III.2 Sediment

III.2.1. Which type(s) of sediment do you sample/measure **bottom, suspended, floodplain**?

Federal Institute for Agropedology: floodplain

III.2.2. Sampling design strategy. How do you choose sampling locations? How do you decide about temporal frequency of collecting samples?

Sampling was carried out from occasionally flooded areas in the Spreča and Bosna valleys, three years in a row after the floods that took place in 2014. The number of locations and their spatial distribution is done according to the "European Soil Monitoring Network"

III.2.3. Which parameters of sediment **quality/quantity** are measured *in situ*?

In situ, no available measurements were made according to available data.

III.2.4. Which appropriate sampling devices (e.g. GRAIFER, CAROTIER etc.) and instruments are used for *in situ* measurements (include manufacturer and type)?

III.2.5. Please, describe **methodology** for *in situ* measurements.

III.2.6. Which **tools** are used for collecting samples for **laboratory** measurements (include manufacturer and type)?

Samples are taken with a probe or a plastic shoulder blade (for testing heavy metal content).

III.2.7. Please, describe a **methodology** for collecting samples for **laboratory** measurements.

Soil sampling is carried out according to the "Operation Procedures Manual and Conditions for Performing Fertility Control". <http://www.uip-zzh.com/files/zakoni/poljoprivreda/akti/72-09a.pdf> Samples for laboratory measurements are taken at depths between 10 and 30 cm. Samples for heavy metal content testing are placed in plastic bags. Samples for the testing of organic pollutants are placed in glass containers.

III.2.8. Please, describe a **transport** methodology for samples intended for laboratory measurements.

No specific methodology.

III.2.9. Do you **archive** samples? If yes, please describe how.

Yes. Retention samples kept in dry, dark room until project completion.

III.3 . Biota

III.3.1. Which type(s) of **biota** do you sample/measure: **flora, fauna** (name species)?

Phytoplankton, phytobenthic, macrophytic, benthic invertebrate and ichtiofauna.

III.3.2. Sampling design strategy. How do you choose sampling locations? How do you decide about temporal frequency of collecting samples?

BAS ISO 5667-1 and BAS ISO 5667-2.

- III.3.3. Which parameters of biota **quality/quantity** are measured *in situ*?
- III.3.4. Which **instruments** are used for *in situ* measurements (include manufacturer and type)?
- III.3.5. Please, describe **methodology** for *in situ* measurements.
- III.3.6. Which **tools** are used for collecting samples for **laboratory** measurements (include manufacturer and type)?
- III.3.7. Please, describe a **methodology** for collecting samples for **laboratory** measurements.
- III.3.8. Please, describe a **transport** methodology for samples intended for laboratory measurements.
- III.3.9. Do you **archive** samples? If yes, please describe how.

[PLEASE, SUPPORT YOUR ANSWERS WITH REFERENCES (NATIONAL LEGISLATIVE DOCUMENTS AND/OR WEB LINKS)]

IV. INVENTORY OF LABORATORY METHODOLOGIES

IV.1. How do you **mechanically prepare samples** for measurement (drying, sieving, grinding, homogenization, etc.)?

- a) water
- b) sediment
- c) biota?

IV.2 Chemicals.

Granulometric analysis (information on the correlation of particle sizes and the absorption of toxic metals or metal compounds in sediments).

Analytical methods (including sample preparation: e.g. acid digestion, etc.) for the hazardous substance analyzed in agreement with the matrix in which it is being analyzed (water, sediment, sludge).

Type of analytical equipments.

Description of internal procedures

Table 21 Standards for the determination of quality of water

No	Title (national language)	Title (Eng)	Standard
1	Kvalitet vode - Određivanje električne provodljivosti	Water quality- determination of electrical conductivity	BAS EN 27888:2002
2	Kvalitet vode - Određivanje rastvorenog oksigena - Jodometrijska metoda	Water quality- Determination of dissolved oxygen -Iodometric method	BAS EN 25813:2000
3	Kvalitet vode - Određivanje nitrogena po Kjeldahlu - Metoda nakon mineralizacije sa selenom	Water quality - Determination of Kjeldahl nitrogen- Method after mineralization with selenium	BAS EN 25663:2000
4	Kvalitet vode – Vodič za izradu i analizu međulaboratorijskih uporednih ispitivanja za	Water quality - Guidance standard on interlaboratory comparison studies for ecological assessment	BAS EN 16101:2014

	ekološku procjenu		
5	Kvalitet vode - Zahtjevi izvedbe i procedure ispitivanja usklađenosti opreme za praćenje stanja vode - Automatski uređaji za uzorkovanje (uzorkivači) vode i otpadne vode	Water quality - Performance requirements and conformity test procedures for water monitoring equipment - Automated sampling devices (samplers) for water and waste water	BAS EN 16479:2015
6	Kvalitet vode - Određivanje suspendovanih čvrstih čestica - Metoda filtriranja kroz filtere od staklenih vlakana	Water quality - Determination of suspended solids - Method by filtration through glass fibre filters	BAS EN 872:2006

Table 22 Methods and standards for the determination of quality of water - biota

No	Title (national language)	Title (Eng)	Standard
1	Kvaliteta vode - Smjernice za mjerenje vodenih makrofita u tekućim vodama	Water quality - Guidance for the surveying of aquatic macrophytes in running waters	BAS EN 14184:2015
2	Kvalitet vode - Detekcija i brojanje spora sulfitoreducirajućih anaeroba (clostridija) - Dio 1: Metoda obogaćivanjem u tečnom mediju	Water quality - Detection and enumeration of the spores of sulfite-reducing anaerobes (clostridia) - Part 1: Method by enrichment in a liquid medium	BAS EN 26461-1:2003
3	Kvalitet vode - Detekcija i brojanje sulfitoreducirajućih anaeroba (clostridija) - Dio 2: Metoda membranskom filtracijom	Water quality - Detection and enumeration of the spores of sulfite-reducing anaerobes (clostridia) - Part 2: Method by membrane filtration	BAS EN 26461-2:2003
4	Kvalitet vode - Smjernice za proporcionalno uzorkovanje bentonitskih makrobeskičmenjaka u plitkim rijekama prema zastupljenosti različitih staništa	Water quality - Guidance on pro-rata Multi-Habitat sampling of benthic macro-invertebrates from wadeable rivers	BAS EN 16150:2013
5	Kvalitet vode – Standardno uputstvo za praćenje, uzorkovanje i	Water quality - Guidance standard for the surveying, sampling and laboratory	BAS EN 15708:2011

	laboratorijsku analizu fitobentosa u plitkim tekućicama	analysis of phytobenthos in shallow running water	
6	Kvaliteta vode - Uzorkovanje riba elektricitetom	Water quality - Sampling of fish with electricity	BAS EN 14011:2004
7	Kvalitet vode - Nomenklturni zahtjevi za bilježenje podataka o bioraznolikosti, za taksonomske kontrolne liste i ključeve	Water quality - Nomenclatural requirements for the recording of biodiversity data, taxonomic checklists and keys	BAS EN 16493:2016
8	Kvalitet vode – Uputstvo za kvantitativno i kvalitativno uzorkovanje fitoplanktona iz kopnenih voda	Water quality - Guidance on quantitative and qualitative sampling of phytoplankton from inland waters	BAS EN 16698:2017
9	Kvalitet vode - Uputstvo za metode uzorkovanja beskičmenjaka u hiporeičnim riječnim zonama	Water quality - Guidance on methods for sampling invertebrates in the hyporheic zone of rivers	BAS EN 16772:2017
10	Kvalitet vode - Savjetodavni standard za praćenje populacija riječne bisernice (Margaritifera margaritifera) i njihove okoline	Water quality - Guidance standard on monitoring freshwater pearl mussel (Margaritifera margaritifera) populations and their environment	BAS EN 16859:2018
11	Kvalitet vode - Smjernice za izbor metoda uzorkovanja i opreme za bentoske makroinvertebrata u slatkim vodama	Water quality - Guidelines for the selection of sampling methods and devices for benthic macroinvertebrates in fresh waters	BAS EN ISO 10870:2014

Table 23 Methods and standards for the determination of quality of water – Determinations of pollutants

Title (National language)	Metoda	Title (Eng)	Methods	Standard
Kvalitet vode - Određivanje nitrita	Metoda molekularne apsorpcijske spektrometrije	Water quality-determination of nitrite	Molecular absorption spectrometric method	BAS EN 26777:2000
Kvalitet vode - Određivanje odabranih	Metoda ekstrakcije na čvrstoj fazi	Water quality - Determination of selected	Method using solid phase extraction (SPE)	BAS EN 16691:2016

polcikličkih aromatskih ugljikovodika (PAH) u cjelovitim uzorcima vode –	(SPE) sa SPE-diskovima i gasnom hromatografijom sa masenom spektrometrijom (GC-MS)	polycyclic aromatic hydrocarbons (PAH) in whole water samples	with SPE-disks combined with gas chromatography mass spectrometry (GC-MS)	
Kvalitet vode - Određivanje organohlorinih pesticida (OCP) u cjelovitim uzorcima vode	Metoda ekstrakcije na čvrstoj fazi (SPE) sa SPE-diskovima i gasnom hromatografijom sa masenom spektrometrijom (GC-MS)	Water quality - Determination of organochlorine pesticides (OCP) in whole water samples	Method using solid phase extraction (SPE) with SPE-disks combined with gas chromatography mass spectrometry (GC-MS)	BAS EN 16693:2016
Kvalitet vode - Određivanje odabranih polibromiranih difeniletera (PBDE) u cjelovitim uzorcima vode	Metoda ekstrakcije na čvrstoj fazi (SPE) sa SPE-diskovima i gasnom hromatografijom sa masenom spektrometrijom (GC-MS)	Water quality - Determination of selected polybrominated diphenyl ether (PBDE) in whole water samples	Method using solid phase extraction (SPE) with SPE-disks combined with gas chromatography - mass spectrometry (GC-MS)	BAS EN 16694:2016
Kvalitet vode - Određivanje jako hlapivih halogeniziranih ugljikovodika-	Metoda gasne hromatografije	Water quality - Determination of highly volatile halogenated hydrocarbons	Gas-chromatographic methods	BAS EN ISO 10301:2002
Kvalitet vode - Određivanje rastvorenih aniona - Dio 1: Određivanje bromida, hlorida, fluorida, nitrata, nitrita, fosfata i sulfata	Tečna ionska hromatografija	Water quality - Determination of dissolved anions - Part 1: Determination of bromide, chloride, fluoride, nitrate, nitrite, phosphate and sulfate - Technical Corrigendum 1	Liquid chromatography of ions	BAS EN ISO 10304-1/Cor1:2015
Kvalitet vode - Određivanje izabranih organskih	Metoda gasne hromatografije	Water quality - Determination of selected organic	Gas chromatographic methods	BAS EN ISO 10695:2002

spojeva nitrogena i fosfora		nitrogen and phosphorus compounds		
Kvalitet vode - Određivanje rastvorenih bromata -)	Metoda određivanja ionskom hromatografijom (IC) i post kolonskom reakcijom (PCR)	Water quality - Determination of dissolved bromate	Method using ion chromatography (IC) and post column reaction (PCR)	BAS EN ISO 11206:2014
Kvaliteta vode – Određivanje sadržaja hroma	Metoda atomske apsorpcione spektrometrije	Water quality - Determination of chromium	Atomic absorption spectrometric methods	BAS EN 1233:2002
Kvalitet vode - Određivanje aluminija	Metoda atomske apsorpcione spektrometrije	Water quality - Determination of aluminium	Atomic absorption spectrometric methods	BAS EN ISO 12020:2002
Kvalitet vode - Određivanje nitrita	Metoda molekularne apsorpcijske spektrometrije	Water quality- determination of nitrite	Molecular absorption spectrometric method	BAS EN 26777:2000

Table 24 Methods and standards for the determination of quality of Sludge, treated biowaste and soil – Determinations of pollutants

Title (National language)	Metoda	Title (Eng)	Methods	Standard
Mulj, tretirani biootpad i tlo - Određivanje pH vrijednosti		Sludge, treated biowaste and soil - Determination of pH		BAS EN 15933:2017
Mulj, tretirani biootpad i tlo - Smjernice za predtretman uzorka		Sludge, treated biowaste and soil - Guidance for sample pretreatment		BAS EN 16179:2017
Karakterizacija mulja – Detekcija i brojanje Escherichia coli u mulju, tlu, sredstvima za obogaćivanje tla, medijima za rast i biootpadu –	Metoda membranske filtracije za kvantifikaciju	Characterization of sludges - Detection and enumeration of Escherichia coli in sludges, soils, soil improvers, growing media and biowastes - Part 1	Membrane filtration method for quantification	BAS CEN/TR 15214- 1:2012

Dio 1				
Karakterizacija mulja – Detekcija i brojanje Escherichia coli u mulju, tlu, sredstvima za obogaćivanje tla, medijima za rast i biootpadu – Dio 2	Mikro metoda (najvjerojatnijeg broja) pomoću inokulacije u vodenom mediju	Characterization of sludges - Detection and enumeration of Escherichia coli in sludges, soils, soil improvers, growing media and biowastes - Part 2	Miniaturised method (Most Probable Number) by inoculation in liquid medium	BAS CEN/TR 15214-2:2012
Karakterizacija mulja – Detekcija i brojanje Escherichia coli u mulju, tlu, sredstvima za obogaćivanje tla, medijima za rast i biootpadu – Dio 3	Makrometoda (najvjerojatnijeg broja) u vodenom mediju	Characterization of sludges - Detection and enumeration of Escherichia coli in sludges, soils, soil improvers, growing media and biowastes - Part 3	Macromethod (Most Probable Number) in liquid medium	BAS CEN/TR 15214-3:2012
Mulj, tretirani biootpad i tlo - Određivanje žive - Dio 1	Atomska apsorpciona spektrometrija hladnih para (CV-AAS)	Sludge, treated biowaste and soil - Determination of mercury - Part 1	Cold-vapour atomic absorption spectrometry (CV-AAS)	BAS EN 16175-1:2018
Mulj, tretirani biootpad i tlo - Određivanje žive - Dio 2	Atomska fluorescentna spektrometrija hladnih para (CV-AFS)	Sludge, treated biowaste and soil - Determination of mercury - Part 2	Cold-vapour atomic fluorescence spectrometry (CV-AFS)	BAS EN 16175-2:2018
Mulj, tretirani biootpad i tlo – Određivanje polihloriranih bifenila (PCB) pomoću GC-ECD ili GC-MS	Gasna hromatografija sa detekcijom	Sludge, treated biowaste and soil - Determination of polychlorinated biphenyls (PCB) by	Gas chromatography with mass selective detection (GC-MS) and gas chromatography with electron-capture detection (GC-ECD)	BAS EN 16167:2017

Table 25 Standards for the Stationary source emissions

No	Title (national language)	Title (Eng)	Standard
1	Emisije iz stacionarnih izvora - Određivanje masene koncentracije PCDD/PCDF i PCB sličnih dioksinu - Dio 1: Uzorkovanje PCDD/PCDF	Stationary source emissions - Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs - Part 1: Sampling of PCDDs/PCDFs	BAS EN 1948-1:2007
2	Emisije iz stacionarnih izvora - Određivanje masene koncentracije PCDD/PCDF i PCB sličnih dioksinu - Dio 2: Ekstrakcija i čišćenje PCDD/PCDF	Stationary source emissions - Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs - Part 2: Extraction and clean-up of PCDDs/PCDFs	BAS EN 1948-2:2007
3	Emisije iz stacionarnih izvora - Određivanje masene koncentracije PCDD/PCDF i PCB sličnih dioksinu - Dio 3: Identifikacija i kvantifikacija PCDD/PCDF	Stationary source emissions - Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs - Part 3: Identification and quantification of PCDDs/PCDFs	BAS EN 1948-3:2007
4	Emisije iz stacionarnih izvora - Određivanje masene koncentracije PCDD/PCDF i PCB sličnih dioksinu – Dio 4: Uzorkovanje i analiza PCB sličnih dioksinu	Stationary source emissions - Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs - Part 4: Sampling and analysis of dioxin-like PCBs	BAS EN 1948-4+A1:2015

IV.2.1. Organic matter. What is the **procedure** for **organic matter** content determination in water and sediment?

IV.2.2. ICP-MS, ICP-AES systems

IV.2.2.1. Which system of analysis do you use (ICP-MS, ICP-AES, etc.)? Please, include manufacturer and type.

IV.2.2.2. Which **elements (HSs)** do you measure by this system? Please, state **detection limits** for measured elements (HSs).

IV.2.2.3. Please, describe **sample preparation and procedure** for these measurements (microwave acid digestion, another disintegration procedure, gas velocity, temperature of atomization, mirrors position, nebulizer type, excitation power, wavelengths etc.).

IV.2.2.4. How do you calculate **accuracy and precision** (references)?

IV.2.3. AAS systems

IV.2.3.1. Please, state manufacturer and type of AAS(F-AAS,GF-AAS) instrument you use.

IV.2.3.2. Which **elements (HSs)** do you measure by AAS? Please, state **detection limits** for measured elements (HSs).

Table 26 Detection limits for elements measured by AAS

Element	Detection limit [µg/L]
Ni	0.5
Cd	0.05
Pb	0.1
Cr	0.5
As	0.5
Cu	0.2

IV.2.3.3. Please, describe **sample preparation and procedure** for AAS measurements (dissolution, radiation source, source temperature, wavelengths, etc.).

IV.2.3.4. How do you calculate **accuracy and precision** (references)?

IV.2.4. XRF

IV.2.4.1. Please, state manufacturer and type of XRF(EDXRF,WDXRF) instrument you use.

IV.2.4.2. Which **elements and/or compounds** (HSs) do you measure by **XRF**? Please, state **detection limits** for measured elements and/or compounds (HSs).

IV.2.4.3. Please, describe **preparation of the sample and procedure** for XRF measurements.

IV.2.4.4. How do you calculate **accuracy and precision** (references)?

IV.2.5 DC-arc –AES

IV.2.5.1. Please, state manufacturer and type of instrument you use (type of detectors etc.).

IV.2.5.2. Which **elements and/or compounds** (HSs) do you measure by **DC-arc-AES**? Please, state **detection limits** for measured elements and/or compounds (HSs).

IV.2.5.3. Please, describe **preparation of the sample and procedure** for DC-arc-AES measurements.

IV.2.5.4. How do you calculate **accuracy and precision** (references)?

IV.2.6. Radionuclides

IV.2.6.1. **Which instrumental method(s)** you use to detect radionuclides in water, sediment and/or biota? Please, state manufacturer and type of radionuclide detection instrument you use.

IV.2.6.2. **Which radionuclides** do you measure? Please, state **detection limits** for measured radionuclides.

IV.2.6.3. How do you calculate **accuracy and precision** (references)?

IV.2.7. Organic compounds (HSs)

IV.2.7.1. Which instrumental method(s) you use to detect organic compounds (HSs) in water, sediment and/or biota?

IV.2.7.2. Which organic compounds (HSs) do you measure?

Please, state **detection limits** for measured organic compounds (HSs).

Table 27 Detection limits in organic compounds analysis

Name of substance	LOD (μL)	LOQ (μL)
benzen	1	1
anthracene	0.013	0.039
benzo (a)piren	0.015	0.045
benzo (g,h,i)perilen	0.002	0.002
benzo (b)fluoranten	0.008	0.025
benzo (k)fluoranten	0.008	0.023
fluoranten	0.013	0.038
indenol (1,2,3-d)piren	0.001	0.002
naftalen	0.016	0.049
Atrazin	0.04	0.14
Simazin	0.04	0.14
hlorfenvinfos	0.1	0.01
hlorpirifos	0.02	0.08
alahlor	0.05	0.16
Diuron	0.01	0.15
izoproturon	0.1	
pentahlorfenol	0.05	0.17
endosulfan	0.01	0.02
heksahlorobenzen	0.01	0.02
pp DDT	0.01	0.02
lindan	0.01	0.02
aldrin	0.01	0.03
dieldrin	0.01	0.03
endrin	0.01	0.03
izodrin	0.01	0.03
Trifluralin	0.01	0.03

IV.2.7.3. How do you calculate **accuracy and precision** (references)?

All applied methods are certified according to ISO/IEC 17025

IV.2.8. XRD

IV.2.8.1. Please, state manufacturer and type of XRD instrument you use.

IV.2.8.2. Do you use **XRD for sediment analysis**?

IV.2.8.3. Please, describe **preparation of the sample and procedure** for XRD measurements

IV.3 Inventory of national laboratories where dangerous substances are analyzed, specifying whether they have accreditations on the quality of analyzes (certificate issued by the national body attesting the quality of the analyzes), price and time of analyses.

IV.4 Description of "good practices" in laboratory and "in situ" analysis. For example, ways to convert analytical data obtained from sediment analysis to water quality assessments (taking into account the high cost of water analysis compared to the sediment).

IV.5 Description of protocols for intercomparison and intercalibration between laboratories. List of national and international projects which had developed the Protocols.

[PLEASE, SUPPORT YOUR ANSWERS WITH REFERENCES (NATIONAL LEGISLATIVE DOCUMENTS AND/OR WEB LINKS)]

V .INVENTORY OF EVALUATION METHODS

V.1. How **threshold values** for HSs are set in each type of media (sediment, water, biota)? (e.g. average of the last measured values, average with the treatment of outliers, average of the values measured in areas without anthropogenic influence, enrichment factor, conservative **elements** for normalization, etc.).

V.2. Are **threshold values fixed or variable** and do they depend on the sample form, drainage basin lithology, time of the year, etc.?

V.3. Do you use **corrections for threshold values**? (amount of **quartz, organic matter** etc.).

V.4 The environmental quality objectives are based on measuring the total metal concentration and / or some dangerous compounds of that metal in different valence states?

V.5 How the legislation reflects the phenomenon of "bioaccumulation"? Is the type of biota correlated with the ecosystem?

V.6. Does your national legislative find **categories of environment quality** based on deviations from threshold values?

V.7. Can these categories be **defined by quality of more than one medium**?

V.8. Please, describe **algorithm for defining** these **categories**? (e.g. weight coefficients).

V.9. How does your legislative framework define **difference** between **contamination** and **pollution**?

V.10. Do you **relate specific HSs** with **sources of contamination and pollution** and how?

V.11. Please, describe **actions** in case of contamination and pollution.

V.12. How do you **present results** in your **reports**, e.g. do you use complex representation for scientific community or simple representation for target groups? Does the report include methodology, full results, QA/QC, models? Are these results public or can be obtained by request?

V.13. Do you have a method for **space-time risk assessment** after determination of contamination and/or pollution?

[PLEASE, SUPPORT YOUR ANSWERS WITH REFERENCES (NATIONAL LEGISLATIVE DOCUMENTS AND/OR WEB LINKS)]

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