

QUESTIONNAIRE FOR EXISTING SAMPLING, LABORATORY AND EVALUATION METHODS

0.0. State your institution and country.

Geological Institute at the Bulgarian Academy of Sciences (GI-BAS), Bulgaria

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

Ministry of Environment and Water (MOEW)

<https://www.moew.government.bg/en/>

Executive Environment Agency (ExEA)

<http://eea.government.bg/en>

Basin Directorate Danube Region (BDDR)

<http://www.bd-dunav.org/>

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.

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

No	Title (in national language)	Title (in English)	Link	Country
1	Рамкова директива за водата (РДВ)	EU Water Framework Directive 2013/39/EU 2008/105/EC 2000/60/EC	https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:226:0001:0017:EN:PDF	Bg
2	Закон за водите	Water law	https://www.moew.government.bg/bg/vodi/za_konodatelstvo/zakoni/	Bg
3	Наредба № Н-4 от 14.09.2012 г. за	Regulation №4 14.09.2012 for	https://www.moew.government.bg/bg/vodi/za_konodatelstvo/naredbi/	Bg

	характеризир ане на повърхностни те води	characteristic s of the surface waters		
4	Наредба за стандарти за качество на околната среда за приоритетни вещества и някои други замърсители	Regulation for quality standards for priority substances and other hazardous substances in the environment	https://www.moew.government.bg/bg/vodi/zakonodatelstvo/naredbi/	Bg
5	Наредба № 1 от 11.04.2011 г. за мониторинг на водите	Regulation №1 11.04.2011 for water monitoring	https://www.moew.government.bg/bg/vodi/zakonodatelstvo/naredbi/	Bg
6	Наредба № 9 от 16.03.2001 г. за качеството на водата, предназначен а за питейно- битови цели	Regulation №9 from 16.03.2001 for the quality of drinking water	https://www.moew.government.bg/static/media/ups/tiny/filebase/Water/Legislation/Naredbi/vodi/Naredba_9.pdf	Bg
7	Закон за почвите	Soil Law	https://www.moew.government.bg/bg/pochvi/zakonodatelstvo/nacionalno-zakonodatelstvo/	Bg
8	ЗАКОН за отговорността за предотвратяв ане и отстраняване на екологични щети (обн. ДВ, бр. 43 от 29.04.2008 г.)	Liability law for the prevention and restoration of ecological damages		
9	НАРЕДБА № 3 от 1 август 2008 г. за нормите за допустимо съдържание на вредни вещества в почвите (обн. ДВ. бр.71 от	Regulation for the levels of maximum allowable concentration of harmful substances in soils	https://www.moew.government.bg/bg/pochvi/zakonodatelstvo/nacionalno-zakonodatelstvo/	BG

	12 Август 2008 г.)			
10	НАРЕДБА № 4 от 12 януари 2009 г. за мониторинг на почвите (обн. ДВ. бр.19 от 13 Март 2009 г.)	Regulation for soil monitoring	https://www.moew.government.bg/bg/pochvi/zakonodatelstvo/nacionalno-zakonodatelstvo/	BG
11	Тематична стратегия за почвите ЕС	Thematic Strategy for Soil Protection EU	https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2006:0231:FIN:EN:PDF	Bg
12		Guide Municipal Soil Management EU	https://www.moew.government.bg/static/media/ups/tiny/filebase/Soil/Programi/08_Guide_for_municipal_soil_management.pdf	Bg

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.

Intervention concentration – the concentration of a harmful substance in a certain media (soil, water), above which the functions of the media are disturbed and there is a threat for the environment and human health.

Maximum allowable concentration - the concentration of a harmful substance in a certain media (soil, water), which under certain conditions leads to disturbance of the functions of the media and threats for the environment and human health.

Alert threshold - the concentration of a harmful substance in a certain media (soil, water), at which the functions of the media are not disturbed and there is not a threat for the environment and human health.

Table 1 Metal trace elements in soils

Trace Element	Standard soil pH (H ₂ O≤6)	Soils pH (H ₂ O)	Levels in soils (mg/kg)		
			B) alert threshold maximum allowable concentration		C) intervention threshold
Metals and their compounds	A) normal values (mg/kg)		B1 Agricultural lands	B2 Grasslands	
Mercury (Hg)	0,03		1,5	1,5	10
As	10		25	30	90
Cd	0,4	<6,0 6,0-7,4 >7,4	1,5 2,0 3,0	2,0 2,5 3,5	12
Cr	65		200	250	550
Cu	34	<6,0 6,0-7,4 >7,4	80 150 300	80 140 200	500
Ni	46	<6,0 6,0-7,4 >7,4	90 110 150	70 80 110	300
Pb	26	<6,0 6,0-7,4 >7,4	60 100 120	90 130 150	500
Zn	88	<6,0 6,0-7,4 >7,4	200 320 400	220 390 450	900
Co	20				

Table 2 Metal trace elements in river water

Trace Element	Levels in river water (µg/l)					
	normal values (annual average)		alert threshold maximum allowable concentration		intervention threshold	
Values based on use category	A1 inland surface waters	A2 other surface waters	B1 inland surface waters	B2 other surface waters	Sensitive C1	Less sensitive C2
Mercury (Hg)			0,07	0,07		
As	10	10	25	25		
Cd	≤ 0,08 (Class 1) 0,08 (Class 2) 0,09 (Class 3) 0,15 (Class 4) 0,25 (Class 5)	0,2	≤ 0,45 (Class 1) 0,45 (Class 2) 0,6 (Class 3) 0,9 (Class 4) 1,5 (Class 5)	≤ 0,45 (Class 1) 0,45 (Class 2) 0,6 (Class 3) 0,9 (Class 4) 1,5 (Class 5)		
Cr 3+	4,7	4,7	32	32		
Cr 6+	3,4	0,6	8	32		
Cu	1 (CaCO ₃ 0-50 mg/l) 6 (CaCO ₃ 50-100 mg/l) 10 (CaCO ₃ 100-250 mg/l) 22 (CaCO ₃ >250 mg/l)	5,2	Not applicable	Not applicable		
Ni	4	8,6	34	34		
Pb	1,2	1,3	14	14		
Zn	8 (CaCO ₃ 0-50 mg/l) 40 (CaCO ₃ 50-100 mg/l) 75 (CaCO ₃ 100-250 mg/l) 100 (CaCO ₃ >250 mg/l)	40	Not applicable	Not applicable		
Al	15	10	10 pH<6.5 25 pH>6.5	25		

Fe	100	50	Not applicable	Not applicable		
Mn	50	50	Not applicable	Not applicable		
U	5	5	40	40		
Ra 226	0,1					

Table 3 Metal trace elements in drinking water

Trace Element Metals and their compounds	Levels in drinking water (µg/l)					
	A)normal values		B>alert threshold maximum allowable concentration		C)intervention threshold	
Values based on use category	A1	A2	B1	B2	Sensitive C1	Less sensitive C2
Mercury (Hg)			0,1			
As			10			
Cd			5			
Cr			50			
Cu			2			
Ni			20			
Pb			10			
Zn			-			

Table 4 Non-metal trace elements in soils

Trace Element Non-metals and their compounds	Levels in soils (mg/kg)					
	A)normal values		B>alert threshold		C)intervention threshold	
Values based on use category	A1	A2	Sensitive B1	Less sensitive B2	Sensitive C1	Less sensitive C2
F						
Cl						
S						
Br						
I						

Table 5 Non-metal trace elements in river water

Trace Element	Levels in river water (µg/l)					
	A)normal values		B>alert threshold		C)intervention threshold	
Values based on use category	A1	A2	Sensitive B1	Less sensitive B2	Sensitive C1	Less sensitive C2
F						
Cl						
S						
Br						
I						

Table 6 Non-metal trace elements in drinking water

Trace Element	Levels in drinking water (µg/l)					
	A)normal values		B>alert threshold Maximum concentration		C)intervention threshold	
Values based on use category	A1	A2	Sensitive B1	Less sensitive B2	Sensitive C1	Less sensitive C2
Fluorides			1,5 mg/l			
Chlorides			250 mg/l			
Free Cl			0,3-0,4 mg/l			
Sulphates			250 mg/l			
Bromates			10 mg/l			
I						
Cyanides			50 mg/l			
Se			10 mg/l			
Phosphates			0,5 mg/l			

Table 7. Hazardous substances in soils

Substance	Background concentration mg/kg	Alert threshold mg/kg	Maximum allowable concentration mg/kg	Intervention threshold mg/kg
Polycyclic aromatic Hydrocarbons				
PAH16(total)	0,150	0,40	4,0	40
Naphthalene	0,022	0,02	0,1	-
Acenaphthene /ACE	0,010	0,03	0,2	-
Acenaphthylene /ACY	0,003	0,03	0,2	-
Florene/FLU*	0,010	0,03	0,3	-
Phenanthrene/PHE	0,015	0,045	0,4	-
Antracene/ANT	0,005	0,050	0,5	-
Fluorantene/FLA	0,015	0,020	0,1	-
Pyrene/PYR	0,008	0,020	0,2	-
Benz[a]anthracene/BaA	0,003	0,020	0,2	-
Chrysene /CHR	0,008	0,020	0,2	-
Benzo[b]fluoranthene/BbF + Benzo[j] fluoranthene /BjF + Benzo[k] fluoranthene /BkF	0,016	0,020	0,2	-
Бензо[а]pyrene/BaP	0,005	0,015	0,1	-
Benzo[e]pyrene/BeP	0,008	0,020	0,15	-
Indeno[1,2,3-cd] pyrene/IND	0,011	0,020	0,2	-
Dibenz[ah]anthracene/DbahA	0,002	0,020	0,1	-
Benzo[ghi]perylene/BghiP	0,004	0,020	0,1	-
Polychlorinated biphenyls				
PCB6 (total)	0,005	0,02	0,2	1
2,4,4'-trichlorobiphenyl PCB-28	0,001	0,001	0,01	
2,2',5,5'-tetrachlorobiphenyl PCB-52	0,001	0,001	0,01	-
2,2',4,5,5'-pentachlorobiphenyl PCB-101	0,001	0,004	0,01	-
2,2',4,4',5'-hexachlorobiphenyl PCB-138	0,001	0,004	0,04	-
2,2',4,4',5,5',- hexachlorobiphenyl PCB-153	0,001	0,004	0,04	-
2,2',3,4,4',5,5',- heptachlorobiphenyl PCB-180	0,000	0,004	0,04	-
Organochlorine pesticides				
Hexachlorobenzene	-	0,025	0,25	10
α-β-γ- (**)- Hexachlorocyclohexane	-	0,001	0,01	2
DDX (total DDT, DDD and DDE)	-			
DDX (total DDT, DDD and DDE)		0,3	1,5	4
2,4' и 4,4'-	-	0,1	0,5	-

Dichlorodiphenyldicloroethelene /-o,p'-и p,p'-DDE/				
2,4' и 4,4'-Dichlorodiphenyl-2,2-dichloroethane /o,p'-and p,p'-DDD/	-	0,1	0,5	-
2,4' и 4,4'- Dichlorodiphenyl - 2,2,2- trichloroethane /o,p' and p,p'-DDT/	-	0,1	0,5	-
Oil products	-	100	300	1200 (5000)*

Table 8. Hazardous substances in drinking water

Substance	Maximum allowable concentration, mg/l
Vinyl chloride	0,5
1,2-dichloroethane	3,0
Epichlorohydrin	0,1
Nitrates	50
Nitrites	0,5
Pesticides total	0,5
Se	10
Tetrachloroethene and trichloroethene	10
Trihalomethanes total	100
Fluorides	1,5
Cyanides	50
Polycyclic aromatic hydrocarbons	0,10

Table 9. Hazardous/priority substances in river water and biota

№	Name of priority substance	CAS number	Annual average	Annual average	Max allowable concentration	Max allowable concentration	Biota Quality standard
			Inland surface waters Quality standard	Other surface waters Quality standard			
1	Alachlor	15972-60-8	0,3	0,3	0,7	0,7	
2	Anthracene	120-12-7	0,1	0,1	0,1	0,1	

3	Atrazine	1912-24-9	0,6	0,6	2	2	
4	Benzene	71-43-2	10	8	50	50	
5	Brominated diphenylethers	32534-81-9			0,14	0,014	0,0085
6	Cadmium and its compounds (depending on water hardness)	7440-43-9	≤0,08(cl.1)) 0,08 (cl.2) 0,09 (cl.3) 0,15 (cl.4) 0,25 (cl.5)	0,2	≤0,45(cl.1)) 0,45 (cl.2) 0,6 (cl.3) 0,9 (cl.4) 1,5 (cl.5)	≤0,45(cl.1)) 0,45 (cl.2) 0,6 (cl.3) 0,9 (cl.4) 1,5 (cl.5)	
6a	Tetrachloromethane Carbon-tetrachloride	56-23-5	12	12	Not applicable	Not applicable	
7	C10-13 Chloroalkanes	85535-84-8	0,4	0,4	1,4	1,4	
8	Chlorfenvinphos	470-90-6	0,1	0,1	0,3	0,3	
9	Chlorpyrifos (Chlorpyrifos-ethyl)	2921-88-2	0,03	0,03	0,1	0,1	
9a	Cyclodiene pesticides: Aldrin Dieldrin Endrin Isodrin	309-00-2 60-57-1 72-20-8 465-73-6	Σ 0,01	Σ 0,005	Not applicable	Not applicable	
9b	DDT total	Not applicable	0,025	0,025	Not applicable	Not applicable	

	Para-para- DDT	50-29-3	0,01	0,01	Not applicable	Not applicable	
10	1,2-Dichloroethane	107-06-2	10	10	Not applicable	Not applicable	
11	Dichloromethane	75-09-2	20	20	N.a.	N.a.	
12	Di(2-ethylhexyl)-Phthalate (DEHP)	117-81-7	1,3	1,3	N.a.	N.a.	
13	Diuron	330-54-1	0,2	0,2	1,8	1,8	
14	Endosulfan	115-29-7	0,005	0,0005	0,01	0,004	
15	Fluoranthene	206-44-0	0,0063	0,0063	0,12	0,12	30
16	Hexachloro-benzene	118-74-1			0,05	0,05	10
17	Hexachloro-butadiene	87-68-3			0,6	0,6	55
18	Hexachloro-cyclohexane	608-73-1	0,02	0,002	0,04	0,02	
19	Isoproturon	34123-59-6	0,3	0,3	1	1	
20	Lead and its compounds	7439-92-1	1,2	1,3	14	14	
21	Mercury and its compounds	7439-97-6			0,07	0,07	20
22	Naphthalene	91-20-3	2	2	130	130	
23	Nickel and its compounds	7440-02-0	4	8,6	34	34	
24	Nonylphenols (4-Nonylphenol)	84852-15-3	0,3	0,3	2	2	
25	Octylphenols (4-(1,1',3,3'- tetramethyl-butyl)-phenol)	140-66-9	0,1	0,01	N.a.	N.a.	
26	Pentachloro-	608-93-5	0,007	0,0007	N.a.	N.a.	

	benzene						
27	Pentachloro-phenol	87-86-5	0,4	0,4	1	1	
28	Polyaromatic hydrocarbons (PAH) (11)	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.
	Benzo(a)pyrene	50-32-8	1,7x10 ⁻⁴	1,7x10 ⁻⁴	0,27	0,027	5
	Benzo(b)fluoranthene	205-99-2	*	*	0,017	0,017	*
	Benzo(k)fluoranthene	207-08-9	*	*	0,017	0,017	*
	Benzo(g,h,i)-perylene	191-24-2-	*	*	8,2x10 ⁻³	8,2x10 ⁻⁴	*
	Indeno(1,2,3-cd)-pyrene	193-39-5	*	*	N.a.	N.a.	*
29	Simazine	122-34-9	1	1	4	4	
29	Tetrachloro-ethylene	127-18-4	10	10	N.a.	N.a.	
29	Trichloro-ethylene	79-01-6	10	10	N.a.	N.a.	
30	Tributyltin compounds (Tributyltin-cation)	36643-28-4	0,0002	0,0002	0,0015	0,0015	
31	Trichloro-benzenes	12002-48-1	0,4	0,4	N.a.	N.a.	
32	Trichloromethane	67-66-3	2,5	2,5	N.a.	N.a.	
33	Trifluralin	1582-09-8	0,03	0,03	N.a.	N.a.	
34	Dicofol	115-32-3	1,3x10 ⁻³	3,2x10 ⁻⁵	N.a.	N.a.	
35	Perfluorooctane sulfonic acid and its derivatives (PFOS)	1763-23	6,5x10 ⁻⁴	1,3x10 ⁻⁴	36	7,2	9,1

36	Quinoxifen	124495-18-7	0,15	0,015	2,7	0,54	
37	Dioxins and dioxin-like compounds	**			N.a.	N.a.	PCDD+ PCDF+ PCB-DL 0,0065 mg.kg ⁻¹ TEQ
38	Aclonifen	74070-46-5	0,12	0,012	0,12	0,012	
39	Bifenox	42576-02-3	0,012	0,0012	0,04	0,004	
40	Cybutryne	28159-98-0	0,0025	0,0025	0,016	0,016	
41	Cypermethrin	52315-07-8	8x10 ⁻⁵	8x10 ⁻⁶	6x10 ⁻⁴	6x10 ⁻⁵	
42	Dichlorvos	62-73-7	6x10 ⁻⁴	6x10 ⁻⁵	7x10 ⁻⁴	7x10 ⁻⁵	
43	Hexabromo-cyclododecane (HBCDD)	*	0,0016	0,0008	0,5	0,05	167
44	Heptachlor and heptachlor epoxide	76-44-8/ 1024-57-3	2x10 ⁻⁷	1x10 ⁻⁸	3x10 ⁻⁴	3x10 ⁻⁵	6,7x10 ⁻³
45	Terbutryn	886-50-0	0,065	0,0065	0,34	0,034	

* For the PAH category (No. 28), the EQS for biota and the corresponding mean annual values (MAV-EQS) for water refer to the concentration of benzo (a) pyrene on which the toxicity is based. Benzo (a) pyrene may be considered as a marker for the other PAHs, therefore only benzo (a) pyrene needs to be monitored for comparison with the EQS for biota or the relevant MAV EQS for water.

** Total DDT includes the sum of isomers 1,1,1-trichloro-2,2 bis (p-chlorophenyl) ethane CAS number 50-29-3; EC number 200-024-3); 1,1,1-trichloro-2 (o-chlorophenyl) -2- (p-chlorophenyl) ethane CAS Number 789-02-6; EC number 212-332-5); 1,1-dichloro-2,2-bis (p-chlorophenyl) ethylene CAS No 72-55-9; EC number 200-784-6); and 1,1-dichloro-2,2 bis (p-chlorophenyl) ethane CAS-No. 72-54-8; EC number 200-783-0)

Table 10. Specific hazardous substances in river water

No	Substance	CAS No	Inland surface waters	Other surface waters
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			Annual average	Max allowable concentration	Annual average	Max allowable concentration
1	Ethylbenzene	100-41-4	10	180	10	180
2	Toluene	108-88-3	50	380	50	380
3	Vinyl chloride	75-01-4	10	103	10	103
4	Xylene (o-, m-, p-)	1330-20-7	15	30	15	30
5	Styrene	100-42-5	20	400	20	400
6	1,4- dichlorobenzene	106-46-7	20	70	20	70
7	1,3- dichlorobenzene	541-73-1	10	285	10	285
8	1,2-dichlorobenzene	95-50-1	10	158	10	158
9	Diethyl phthalate	84-66-2	180	1200	180	1200
10	Diisobutyl phthalate	84-69-5	3,8	N.a.	3,8	N.a.
11	Bisphenol A	80-05-7	1	11	1	11
12	Dibutyl phthalate DBP	84-74-2	10	N.a.	10	N.a.
13	2, 4, 4' - Trichlorobiphenyl PCB-28	7012-37-5	0,0005	N.a.	0,0005	N.a.
14	2, 2', 5, 5' - tetrachlorobiphenyl PCB 52	35693-99-3	0,0005	N.a.	0,0005	N.a.
15	2, 2', 4, 5, 5' - Pentachlorobiphenyl PCB 101	37680-73-2	0,0005	N.a.	0,0005	N.a.
16	2, 2', 3, 4, 4', 5- Hexachlorobiphenyl PCB 138	35065-28-2	0,0005	N.a.	0,0005	N.a.
17	2, 2', 4, 4', 5, 5' - Hexachlorobiphenyl PCB 153	35065-27-1	0,0005	N.a.	0,0005	N.a.
18	2, 2', 3, 4, 4', 5, 5' - Heptachlorobiphenyl PCB 180	35065-29-3	0,0005	N.a.	0,0005	N.a.
19	Acenaphthene	83-32-9	3,8	50	3,8	50
20	Acenaphthylene	208-96-8	0,64	N.a.	0,128	N.a.
21	Benzo(a)anthracene	56-55-3	0,01	N.a.	0,01	N.a.
22	Chrysene	218-01-9	0,02	N.a.	0,02	N.a.
23	Dibenzo(a,h)- anthracene	53-70-3	0,02	N.a.	0,02	N.a.
24	Fluorene	86-73-7	2,5	N.a.	2,5	N.a.
25	Phenanthrene	85-01-8	1,3	N.a.	1,3	N.a.
26	Pyrene	129-00-0	0,012	N.a.	0,012	N.a.
27	Ametryn	834-12-8	0,1	0,1	0,1	0,1
28	Linuron	330-55-2	0,1	0,1	0,1	0,1
29	Prometon	1610-18-0	1	1	1	1
30	Prometryn	7287-19-6	0,2	0,2	0,2	0,2
31	Propazine	139-40-2	0,25	0,25	0,25	0,25
32	Parathion-Ethyl	56-38-2	0,005	0,005	0,005	0,005
33	Parathion-Methyl	298-00-0	0,01	0,01	0,01	0,01
34	Methoxychlor	72-43-5	0,005	0,005	0,005	0,005
35	2,4- dichlorophenoxyacetic acid + ester (2,4-D)	94-75-7	0,33	1,3	0,33	1,3
36	Dicamba	1918-00-9	5	10	5	10

37	Dimethoate	60-51-5	0,4	4	0,4	4
38	Phenytrotion	122-14-5	0,01	0,01	0,01	0,01
39	Phentyon	55-38-9	0,004	0,01	0,004	0,01
40	Malathion	121-75-5	0,01	0,02	0,01	0,02
41	Acetochlor	34256-82-1	0,01	0,05	0,01	0,05
42	Diazinon	333-41-5	0,02	0,025	0,02	0,025
43	Mecoprop	7085-19-0	16	160	16	160
44	Pendimethalin	40487-42-1	0,3	0,54	0,3	0,54
45	Bentazon	25057-89-0	3,2	35	3,2	35
46	2-methyl-4-chlorophenoxyacetic acid MCPA	94-74-6	1,7	3,4	1,7	3,4

Table. Microbiological parameters for drinking water

Index	Concentration Colony Forming Units/ml
Escherichia coli	0/25
Enterococci	0/25
Pseudomonas aeruginosa	0/25
Colonies (Microbe number) a 22°	100 per 1ml
Colonies (Microbe number) a 37°	20 per 1 ml
Clostridium perfringens	0/100
Coliforms	0/100

Coliforms and E.coli: БДС EN ISO 9308-1

Enterococci: БДС EN ISO 7899-2

Pseudomonas aeruginosa: БДС EN 12780

Number of colonies 22 °C and 37 °C: БДС EN ISO 6222

Clostridium perfringens (including spores): БДС EN 26461-2

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

I.3 Quality objectives for hazardous substances (please complete the tables of HSs according to national documents) – see table 9

Dangerous substance (HS)	Water quality objective (µg/l)	Quality target for sediment (mg/kg)	Quality objective for biocenosis (mg/kg)
Cd	5	10	-mollusks (as far as possible Mytilus edulis) and fish.
Hg	0.1	-	0.3 mollusks and fish

I.4 Listing of analytical standards (national analytics and international e.g. USEPA, ASTM, etc.) recommended in documents for chemical, physical, microbiological analyzes of samples

Element	National analytical standards					International analytical standards					“in-house” developed methods”		
Mercury 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
 - not used by executive laboratories in Bulgaria. ISOs and Internal Laboratory Standards are preferentially used

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).

No information available

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

Nr		sediment	soil	water
1	Water quality. Sampling – bottom sediments from rivers, lakes, and estuaries	BDS ISO 5667-12:2017		
2	Soil quality. Gas-chromatographic determination of volatile aromatic HCs, naphtalene and volatile halogenated HCs		BDS EN ISO 15009:2016	
3	Sediments, processed bio-wastes, and soils. ICP-MS determinations.		BDS EN 16171:2016	
4	Soil quality. Determination of polycyclic aromatic hydrocarbons (PAH). Gas-chromatographic method with mass spectrometric detection (GC-MS)		ISO 18287:2006	
5	Soil quality. Determination of particle size distribution in mineral soil material. Method by sieving and sedimentation		ISO 11277:2009	
6	Soil quality. Organic carbon determination by sulphochromic oxidation		BDS ISO 14235:2002	
7	Organochlorine pesticides and polychlorine biphenyls determination in soils, sediments, and sludge		ILM* 4006/2010	

*ILM - Internal laboratory method

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

In case of damaged terrains recultivation projects according to the related Environmental laws are implemented.

1. Analysis of the damaged area;
2. Detailed investigation including environmental risk assessment and human health risk assessment;
3. Design and implementation of projects for restoration of damaged areas;
4. Monitoring and maintenance of the functions of the restored areas.

II PRACTICES, EXPERIENCES

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

For additional projects, see <http://eea.government.bg/en/projects/index.html>

No.	Project title (national language, if available)	Project Title (EN)	Year	Country	Project coordinators, Partners
1	План за управление на речните басейни Дунавски район 2016-2021	Danube River Basin Management Plan	2016-2021	Bulgaria	BDDR
2	Проект за подготовка и разработване на втори трети цикъл планове за управление на речните басейни за периода 2022-2027г.	Project for preparation and development of second and third cycle river basin management plans for 2022-2027	2022-2027	Bulgaria	BDDR
3	Разработване на планове за управление на речните басейни – Определяне на стандарти за качество за химичното състояние на повърхностните води	Project for design of river basin management plans - Determination of quality standards for the surface water chemical status	2007-2013	Bulgaria	MOWE, Consortium for integral water management (Консорциум за интегрално управление на водите)
4	Проект „Проучване и оценка на химичното състояние на повърхностни води“	Project "Survey and assessment of surface water chemical status"	2014-2017	Bulgaria	MOEW, "AKBA-ENV" Consortium
5	Подход за определяне на фонові концентрации за химични елементи	Approach for assessing background concentration	2014-2017	Bulgaria	MOEW, "AKBA- ENV" Consortium

		of chemical elements			
6	Интегрирано управление на водите на река Дунав	WATER	2007-2013	Bulgaria, Romania	
7	Съвместно изследване на река Дунав	Joint Danube Survey 1, 2, 3	2001, 2007, 2013		ICPDR
8		Romanian-Bulgarian cross-border joint natural and technological hazards assessment in the Danube Floodplain – ROBUHAZ-DUN	2007-2013	Romania, Bulgaria	
9	Намаляване на риска от наводнения чрез възстановяване на заливни равнини по р. Дунав и притоците ѝ	Danube Floodplain	2018-2020	Romania, Austria, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Slovakia, Slovenia, Serbia	
10	Дунав Седимент	Danube Sediment	2017-2019	Hungary, Austria, Romania, Bulgaria	

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

No.	Paper title (national language, if available)	Title (EN)	Year	Country	Authors

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

Danube River – 1 water body
Quality Monitoring Stations – 3 stations part of TNMN

- Danube River Basin – 256 water bodies**
- Water Monitoring Sites for *Hazardous/priority substances* – 243 sites, 12 times a year (*Appendix 4.1.1.2.*)
 - Hydrobiological Monitoring Sites – 195 river + 35 lake (*Appendix 4.1.1.3.*)
 - Biota Monitoring Sites for *Hazardous/priority substances* – 50 sites, 1 time a year (*Appendix 4.1.1.4.*)
 - Sediment Monitoring Sites for *Hazardous/priority substances* – 35 sites, 1 time every 3 years (*Appendix 4.1.1.4.*)

Danube River Quality Monitoring Stations 3 stations part of TNMN

No.	Site	Country	x	y
1	Baikal village	Bg	24,40002	43,71105
2	Novo selo, right bank	Bg	22,78528	44,16517
3	Silistra, port, right bank	Bg	27,2675	44,12497

No.	Site coordinates (North, East) in WGS84 system (at least seven decimals points)	Project title (national language)	Project title (EN)	Year	Country	Obs.(type of analysis, purpose of monitoring, sampling rate)
1						
2						
3						

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 for ecological monitoring and assessment of the environment in Bulgaria is carried out in accordance with:

- Danube River Basin Management Plans

<http://www.bd-dunav.org/content/upravlenie-na-vodite/plan-za-upravlenie-na-rechniia-baseyn/>

- EU Water Framework Directive (2013/39/EU) and its related guidance documents

- Report for the approaches for assessing the tendencies of hazardous substances concentration in sediments and biota ("AKBA-EHB", Consortium)

- Related ISO and БДC (State standards) methodologies (ISO 5667, etc)

The sampling strategy is designed by the Bulgarian Danube River Basin Directorate in accordance with the National legislation. The preparation, preservation and analysis of the samples are carried out under the management of the Executive Environmental Agency in Bulgaria.

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 strategy is defined by the River Basin Management Plan for the Danube Region (2016-2021) and is executed by the ExEA.

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

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.

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).

БДC EN ISO 5667-3:2000 - Water quality. Sampling - Part 3: Guidance on samples preparation and preservation (ISO 5667-3:1994)

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

ISO 5667-1:2018 - Water quality. Sampling – Part 1: Guidance for development of programs and techniques for sampling.

БДC EN ISO 5667-14:2016. Water quality. Sampling - Part 14: Quality assurance and quality control manual for sampling and treatment of natural water samples (ISO 5667-14: 2014)

БДC EN ISO 5667-6:2016. Water quality. Sampling - Part 6: Guidance on sampling of rivers and streams

III.2 Sediment

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

bottom sediments only

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

Sampling strategy is defined by the River Basin Management Plan for the Danube Region (2016-2021) and is executed by the ExEA.

Monitoring sites location determined after recommendations of project "Survey and assessment of the surface water chemical status" - approaches for assessment and trends in the concentration of pollutants in sediments and biota, "AKVA-ENV" consortium (manager of project – prof. d-r Irina Karadjova)

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

none

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

n/a

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

n/a

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

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

БДC EN ISO 5667-13:2011 - Water quality. Sampling. Part 13: Sediment sampling guide

БДC ISO 5667-12:2017 - Water quality. Sampling. Part 12: Manual for sampling of bottom sediments from rivers, lakes and estuary areas

БДC ISO 5667-17:2012 - Water quality. Sampling. Part 17: Guidance on sampling banks and suspended material

БДC EN ISO 5667-15:2009 Water quality. Sampling. Part 15: Guidance for preparation and preservation of sediment samples

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

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

III.3 . Biota

БДС EN ISO 5667-16:2017 Water quality. Sampling. Part 16: Guidance for biological analysis

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

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

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?

ISO 5667-3:2018 - Water quality - Sampling - Part 3: Preservation and handling of water samples

ISO 5667-15:2009 - Water quality - Sampling - Part 15: Guidance on the preservation and handling of sludge and sediment samples

BSS EN 13946:2004 – Water quality. Standard for sampling and preparation of diatom algae samples from rivers

IV.2 Chemicals

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

- General conclusions are based only on fine (<0.063mm) fractions chemistry

ISO 11277:2009 - Soil quality. Determination of particle size distribution in mineral soil materials. Method by sieving and sedimentation

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

The above listed procedures are involved in the certified labs of ExEA

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

water - BSS EN 1484:2001- Total organic carbon; dissolved organic carbon

soil/ sediment - BSS ISO 14235:2002 - Soil quality. Organic carbon determination by sulfo-chrome oxidation

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.

ICP-MS

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.).

Microwave acid digestion

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

Table IV.2.2.1. Metal trace elements in river water

Element	Method	detection limits (mg/l)	accuracy (mg/l)
Hg	VIM 1012/2010 (1 2.3.4)		0.1
As	BSS EN ISO 17294/2004		0.03
Cd	BSS EN ISO 17294/2004		0.005
Cr total	BSS EN ISO 17294/2004; BSS 17.1.4.17 (1,2,3)	0.0015	0.005
Cr 3+	BSS 17.1.4.17 (1,2,3)		0.01
Cr 6+	BSS 17.1.4.17 (1,2,3)		0.002
Cu	BSS EN ISO 17294/2004		0.05
Ni	BSS EN ISO 17294/2004		0.05
Pb	BSS EN ISO 17294/2004		0.001
Zn	BSS EN ISO 17294/2004		0.1
Al	BSS EN ISO 17294/2004		0.1-0.5
Fe total; dissolved	VIM 1004/2010;	0.003	0.015
Mn	BSS EN ISO 17294/2004		0.04
U	BSS EN ISO 17294/2004		0.01
Ra 226	BSS 12575 (1 2,3.4)		

BSS - Bulgarian State Standard

VIM - Validated In-house Method

VIM 1004/2010 – Determination of total and dissolved iron in water - **ICP-MS**;

BSS ISO 6332 (1,2,3,4) - Determination of total and dissolved iron in water

BSS EN ISO 15586:2004 - Determination of total and dissolved iron in water

VIM 1012/2010 – Methodolgy for determination of total and dissolved mercury in water - **ICP-MS**

ISO 17294-2:2016 specifies a method for the determination of the elements Al, Sb, As, Ba, Be, Bi, B, Cd, Cs, Ca, Ce, Cr, Co, Cu, Dy, Er, Gd, Ga, Ge, Au, Hf, Ho, In, Ir, Fe, La, Pb, Li, Lu, Mg, Mn, Hg, Mo, Nd, Ni, Pd, P, Pt, K, Pr, Ru, Re, Rh, Sm, Sc, Se, Ag, Na, Sr, Tb, Te, Th, Tl, Tm, Sn, W, U and its isotopes, V, Y, Yb, Zn and Zr **in water** (for example, drinking water, surface water, ground water, waste water and eluates).

Table IV.2.2.2. Metal trace elements in soils

Hg	BSS EN 16171
As	BSS EN 16171
Cd	BSS EN 16171
Cr	BSS EN 16171
Cu	BSS EN 16171
Ni	BSS EN 16171
Pb	BSS EN 16171
Zn	BSS EN 16171
Co	BSS EN 16171

БДС EN 16171,2016- Processed sediment and soils. Element determination with (ICP-MS)

III. biota

VIM 1201/2010 - Method for the detection of metals and metalloids in marine and river organisms (molluscs, fish, algae) - Al, As, Cd, Hg, Cu, Ni, Pb, Cr, Zn

IV.2.3. AAS systems

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

Flame AAS

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

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

Microwave acid digestion

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

Table IV.2.3.1. Metal trace elements in river water

Element	Method	detection limits (mg/l)	accuracy (mg/l)
Hg	VIM 1012/2010 (1 2.3.4)		0.01
As	BSS EN ISO 17294/2004		1-10
Cd	BSS EN ISO 17294/2004		0.014
Cr total	BSS EN ISO 17294/2004; BSS 17.1.4.17 (1,2,3)		0.05-1
Cr 3+	BSS 17.1.4.17 (1,2,3)		0.01
Cr 6+	BSS 17.1.4.17 (1,2,3)		0.002
Cu	BSS EN ISO 17294/2004		1-2
Ni	BSS EN ISO 17294/2004		3-4
Pb	BSS EN ISO 17294/2004		0.5-1
Zn	BSS EN ISO 17294/2004		20-50
Al	BSS EN ISO 17294/2004		0.5-1
Fe total; dissolved	VIM 1004/2010;		1-2 0.01
Mn	BSS EN ISO 17294/2004		0.2-0.5

ISO 8288:1986 - Water quality -- Determination of cobalt, nickel, copper, zinc, cadmium and lead -- Flame atomic absorption spectrometric methods

Table IV.2.3.2. Metal trace elements in soils/sediments

Element	Method
Hg	
As	
Cd	ISO 11047
Cr	ISO 11047
Cu	ISO 11047
Ni	ISO 11047
Pb	ISO 11047
Zn	ISO 11047
Co	ISO 11047

ISO 11047/1998 - Soil quality -- Determination of cadmium, chromium, cobalt, copper, lead, manganese, nickel and zinc -- Flame and electrothermal atomic absorption spectrometric methods

IV.2.4. XRF – not used for monitoring of HSs in sediments in Bulgaria

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 - not used for monitoring of HSs in sediments in Bulgaria

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)?

I –water

Table IV.2.6.1.

Parameter	Standard	Method

Gross alpha activity	BSS ISO 9696 (1 2 3.4)	Test method using thick source
Gross beta activity	BSS ISO 9697 (1 2 3.4)	Test method using thick source
Uranium	VIM 1020/2010 (1,2 3.4)	spectral-photometric
Radium-226	BSS 12575 (1 2,3.4)	
Tritium	BSS EN ISO 9698 (1,2 3,4)	Liquid scintillation counting method
Radon - 222	VIM 1021/2010 (1 2 3.4)	

ISO 9696:2017 - Water quality - Gross alpha activity

ISO 9697:2017 - Water quality - Gross beta activity in non-saline water - Test method using thick source

ISO 9698:2010 - Water quality -- Determination of tritium activity concentration - Liquid scintillation counting method

Natural uranium - VIM 1020/2010 (1,2 3.4) - Methodology for determination of uranium in waters - spectrophotometric

VIM 1021/2010 (1 2 3.4) – Methodology for volume activity/concentration in water - spectrophotometric

БДС EN ISO 10703 (1,2,3,4) - Water quality - Determination of the activity concentration of radionuclides - Method by high resolution gamma-ray spectrometry

II - soils/ sediments

Table IV.2.6.2.

Parameter	Standard	Method
Specific activity of gamma emitting - radionuclides (²³⁸ U, ²²⁶ Ra, ²³² Th, ²³⁰ Th, ²¹⁰ Pb, 40K, ¹³⁷ Cs, ¹³⁴ Cs, ⁶⁰ Co et al., exposition up to 24 h	ISO 18589-3	gamma-ray spectrometry
		radiochemical

ISO 18589-3 - Measurement of radioactivity in the environment - Soil - Part 3: Test method of gamma-emitting radionuclides using gamma-ray spectrometry (ISO 18589-3:2015, Corrected version 2015-12-01) in radiological labs

III. Biota

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?

GC-MS

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

Table IV.2.7.1. Hazardous/priority substances in river water and biota

№	Name of priority substance	CAS number	standarts/Method	accuracy (mg/l)
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1	Alachlor	15972-60-8	VIM 1015/2010	0.005
2	Anthracene	120-12-7	VIM 1016/2010	0.01
3	Atrazine	1912-24-9	VIM 1015/2010	0.005
4	Benzene	71-43-2	BSS EN ISO 15680	0.005
5	Brominated diphenylethers	32534-81-9	Not analyzed	
6	Cadmium and its compounds (depending on water hardness)	7440-43-9	BSS EN ISO 17294-2	0.005
6a	Tetrachloromethane Carbon-tetrachloride	56-23-5	BSS EN ISO 15680	0.01-0.1
7	C10-13 Chloroalkanes	85535-84-8	Not analyzed	0.4
8	Chlorfenvinphos	470-90-6	BSS EN ISO12918	0.004
9	Chlorpyrifos (Chlorpyrifosethyl)	2921-88-2	BSS EN ISO12918	0.004
9a	Cyclodiene pesticides: Aldrin Dieldrin Endrin Isodrin	309-00-2 60-57-1 72-20-8 465-73-6	VIM 1014/2010 VIM 1014/2010 VIM 1014/2010 VIM 1014/2010	0.01 0.005 0.01 0.005
9b	DDT total	Not applicable		
	Para-para- DDT	50-29-3	VIM 1014/2010	0.005
10	1,2-Dichloroethane	107-06-2	BSS EN ISO 15680	0.005
11	Dichloromethane	75-09-2	BSS EN ISO 15680	0.01
12	Di(2-ethylhexyl)-Phthalate (DEHP)	117-81-7	Not analyzed	0.005
13	Diuron	330-54-1	Not analyzed	
14	Endosulfan	115-29-7	VIM 1014/2010	0.01
15	Fluoranthene	206-44-0	VIM 1016/2010	0.005
16	Hexachlorobenzene	118-74-1	VIM 1014/2010	0.005
17	Hexachlorobutadiene	87-68-3	BSS EN ISO 15680	0.01
18	Hexachlorocyclohexane	608-73-1	VIM 1014/2010	0.005
19	Isoproturon	34123-59-6	Not analyzed	
20	Lead and its compounds	7439-92-1	BSS EN ISO 17294-2	
21	Mercury and its compounds	7439-97-6	VIM 1012/2010; БДС EN ISO 12846	
22	Naphthalene	91-20-3	VIM 1016/2010	0.01
23	Nickel and its compounds	7440-02-0	BSS EN ISO 17294-2	
24	Nonylphenols (4-Nonylphenol) CAS_104--40-5	84852-15-3	BSS EN ISO 18857-1	0.01
25	Octylphenols (4-(1, 1',3,3'-tetramethyl- butyl)-phenol)	140-66-9	BSS EN ISO 18857-1	0.005
26	Pentachlorobenzene	608-93-5	VIM 1014/2010	0.01
27	Pentachlorophenol	87-86-5	BSS EN ISO 12673	0.005

28	Polyaromatic hydrocarbons (PAH) (11)	N.a.		
	Benzo(a)pyrene	50-32-8	VIM 1016/2010	0.01
	Benzo(b) fluoranthene	205-99-2	VIM 1016/2010	0.004
	Benzo(k) fluoranthene	207-08-9	VIM 1016/2010	0.004
	Benzo(g,h,i)perylene	191-24-2-	VIM 1016/2010	0.005
	Indeno(1,2,3- cd)-pyrene	193-39-5	VIM 1016/2010	0.005
29	Simazine	122-34-9	VIM 1015/2010	0.01
29a	Tetrachloroethylene	127-18-4	BSS EN ISO 15680	0.4
29b	Trichloroethylene	79-01-6	BSS EN ISO 15680	0.04
30	Tributyltin compounds (Tributyltin-cation)	36643-28-4	Not analyzed	0.005
31	Trichlorobenzenes	12002-48-1	BSS EN ISO 15680	0.005
32	Trichloromethane	67-66-3	BSS EN ISO 15680	0.04
33	Trifluralin	1582-09-8	VIM 1015/2010	0.005
34	Dicofol	115-32-3		
35	Perfluorooctane sulfonic acid and its derivatives (PFOS)	1763-23		
36	Quinoxifen	124495-18-7		
37	Dioxins and dioxin-like compounds	**		
38	Aclonifen	74070-46-5		
39	Bifenox	42576-02-3		
40	Cybutryne	28159-98-0		
41	Cypermethrin	52315-07-8		
42	Dichlorvos	62-73-7		
43	Hexabromocyclododecane (HBCDD)	*		
44	Heptachlor and heptachlor epoxide	76-44-8/ 1024-57-3		
45	Terbutryn	886-50-0		

Identification of newly identified substances No 34-45 in the table had come in force since December 22nd 2018.

БДС EN12918 (1,2,3,5) – organophosphorus compounds

БДС EN ISO 18857-1(1,2,3,5) - alkylphenols

БДС EN 12673(1.2.3 5) – chlorophenols

БДС EN ISO 15680/2003 Water quality -- Gas-chromatographic determination of a number of monocyclic aromatic hydrocarbons, naphthalene and several chlorinated compounds using purge-and-trap and thermal desorption

БДС EN ISO 15680 (1,2,3,5) – naphthalene

VIM 1014/2010 - Method for the identification of organochlorinated pesticides (OCP), polychlorinated biphenyls (PCBs), chlorobenzenes in water – GC-MS

VIM 1015/2010 – Method for assessing nitrogen and phosphorus containing pesticides in water - **GC-MS**

VIM 1016/2010 Method for identifying polycyclic aromatic hydrocarbons (PAHs) in waters - GC-MS

phenols – spectrometric method

oils - IRS

Table IV.2.7.2. Hazardous substances in soils - GC-MS

Substance	
Polycyclic aromatic Hydrocarbons	ISO 18287
PAH16(total)	
Naphthalene	
Acenaphthene /ACE	
Acenaphthylene /ACY	
Fluorene/FLU*	
Phenanthrene/PHE	
Anthracene/ANT	
Fluoranthene/FLA	
Pyrene/PYR	
Benz[a]anthracene/BaA	
Chrysene /CHR	
Benzo[b]fluoranthene/BbF + Benzo[j] fluoranthene /BjF + Benzo[k] fluoranthene /BkF	
Benzo[a]pyrene/BaP	
Benzo[e]pyrene/BeP	
Indeno[1,2,3-cd] pyrene/IND	
Dibenz[ah]anthracene/DbahA	
Benzo[ghi]perylene/BghiP	
Polychlorinated biphenyls	VIM 4006/2010
PCB6 (total)	
2,4,4'-trichlorobiphenyl PCB-28	
2,2',5,5'-tetrachlorobiphenyl PCB-52	
2,2',4,5,5'-pentachlorobiphenyl PCB-101	
2,2',4,4',5'-hexachlorobiphenyl PCB-138	
2,2',4,4',5,5',- hexachlorobiphenyl PCB-153	
2,2',3,4,4',5,5',-heptachlorobiphenyl PCB-180	
Organochlorine pesticides	VIM 4006/2010 (1,2,3,5)
Hexachlorobenzene	
α - β - γ - (**)-Hexachlorocyclohexane	
DDX (total DDT, DDD and DDE)	
DDX (total DDT, DDD and DDE)	
2,4' и 4,4'- Dichlorodiphenyldicloroethelene /-o,p'-и p,p'-DDE/	

2,4' и 4,4'-Dichlorodiphenyl-2,2-dichloroethane /o,p'-and p,p'-DDD/	
2,4' и 4,4'- Dichlorodiphenyl -2,2,2- trichloroethane /o,p' and p,p'-DDT/	
Oil products	BSS EN ISO 16703

БДС EN ISO 15009:2016 – Soil quality. Gas chromatographic determination of volatile aromatic hydrocarbons, naphthalene and volatile hydrocarbons. Method of purging and capture by thermal desorption
 ISO 18287:2006- Soil quality. Determination of polycyclic aromatic hydrocarbons (PAHs). Gas chromatographic method with mass spectrometric detection (**GC-MS**)
 VIM 4006/201 - Method for the determination of organochlorine pesticides, polychlorinated biphenyls and chlorobenzenes in soils, sediments - GC-MS

III. biota

Table IV.2.7.3. Hazardous/priority substances in river water and biota

	CAS
Brominated diphenylethers	32534-81-9
Fluoranthene	206-44-0
Hexachlorobenzene	118-74-1
Hexachlorobutadiene	87-68-3
Mercury and its compounds	7439-97-6
Benzo(b) fluoranthene	205-99-2
Benzo(k) fluoranthene	207-08-9
Benzo(g,h,i)perylene	191-24-2
Indeno(1,2,3- cd)-pyrene	193-39-5
Dicofol	115-32-2
Perfluorooctane sulfonic acid and its derivatives (PFOS)	1763-23-1
Dioxins and dioxin-like compounds	
Hexabromocyclododecane (HBCDD)	
Heptachlor and heptachlor epoxide	

IV.2.8. XRD – not used for analysis of sediments concerning HSs monitoring

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**?

no

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.

All measurements and observations are carried out by the structures of the ExEA (Executive Environment Agency, MOEW, Bulgaria) in common, unified methods for sampling and analysis in accordance with the procedures ensuring the quality of measurements and data. All ExEA laboratories are accredited under the BS EN ISO/IEC 17025-General requirements for competence in testing and calibration from EA BAS. - <http://eea.government.bg/en/nsmos/index.html>

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.

<http://eea.government.bg/en/projects/index.html>

"Danube WATER integrated management" – WATER

Capacity building and improvement of the national system for monitoring the subterranean waters for implementation of framework directive on waters 2000/60/EC

Development and implementation of a soil monitoring and assessment framework for the republic of Bulgaria

NATIONAL PROGRAMME for monitoring of sediments in water bodies

ISO 10304-1:2007. Water quality -- Determination of dissolved anions by liquid chromatography of ions -- Part 1: Determination of bromide, chloride, fluoride, nitrate, nitrite, phosphate and sulphate.

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.).

Quality standards for priority substances and other specific pollutants are defined with Regulation of the Ministry of the Environment and Water, Bulgaria. They refer to surface water and partly to biota, whereas for sediments there are no such

standards. An average annual value is used, which means that for each representative monitoring site for a water body, the arithmetic mean value of the concentrations measured at different times of the year does not exceed the value set in the standard. A maximum permissible concentration is also used, which means that the measured concentration at any point of monitoring within the water body does not exceed the standard.

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

The quality standard values are fixed but when assessing the results of the monitoring for different quality standard, Basin Directorates can take into account the natural background concentrations of metals and their compounds, water hardness, pH, dissolved organic carbon and other water quality parameters.

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

No information available at this point

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?

For most metals, the total metal concentration is measured. For chromium the 3- and 6-valent form is measured. For some elements such as Cd, Cu, Zn, quality standards vary depending on the water hardness.

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

The European directives and guidelines referring the term "bioaccumulation" are adopted and applied.

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

Environmental quality categories for surface water characteristics are defined by Regulation No. H-4 14.09.2012. Five categories are established: excellent, good, moderate, bad, and very bad ecological status.

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

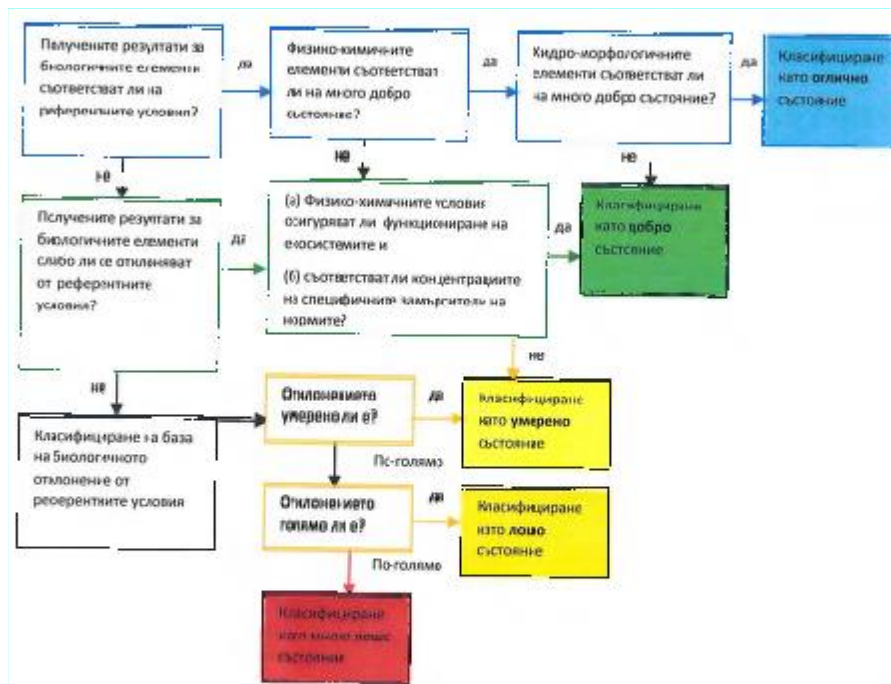
The assessment of the ecological status of surface water bodies is based on developed classification systems for the assessment of individual type-specific quality elements. A set of hydrobiological monitoring data, physicochemical analysis related to biological quality elements, a set of specific pollutants defined at national level, as well as hydromorphological changes are used.

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

The general approach to the classification of the ecological status is presented in Figure 1 and covers:

- Condition of biological quality elements
- Concentrations of related physical and chemical elements for quality and concentration of specific pollutants
- For differentiating excellent from good ecological status - hydromorphological elements for quality are used

Fig. 1 Relative role of biological, physico-chemical and hydromorphological quality elements for classifying ecological status (from WFD CIS Guidance Document № 13)



Common principles for determining the environmental status for different surface waters categories are regulated by Art. 135, item 9 of the Water Act. Assessment of biological quality elements is the guideline in determining ecological status and physicochemical elements are supportive. For each type of water bodies, limit values have been developed for the 5 categories set out in Annexes 6 and 7 of Art 12, par 4 of Regulation H-4 for characterization of surface water.

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

The Environmental Protection Act distinguishes the following two terms:

- - "Environmental pollution" is the change in the properties as a result of occurrence and introduction of physical, chemical or biological factors from a natural or anthropogenic source in or outside the country, regardless if the national norms in force are exceeded.

- "Environmental damage" is such an alteration of one or more components, resulting in a deterioration in the quality of life of humans, the deterioration of biodiversity or difficult restoration of natural ecosystems.

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

If a water body is found to be of poor or very poor ecological status, or if concentrations of hazardous substances are exceeding the specified quality standards, possible sources of contamination are analyzed.

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

See 1.7.

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?

Information is available for the public. Results can be presented in general and / or targeted to individual target groups. The results are public on the sites of the Basin Directorates and the ExEA. Research data itself can be provided by the responsible institutions upon request.

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

The assessment method for the change in concentrations of pollutants (HS) is the same for biota and sediment.

When obtaining at least 4 consecutive results as a trend assessment approach, the nonparametric method of Mann Kendall (Hirsch and Slack 1984) is used. The method is suitable because it allows working with less than 6 results. There is no claim for a normal distribution of the results, which in any case cannot be assessed with such scarce data.

The nonparametric method of Mann Kendall is applicable when the pollutant values (x_i) are considered to follow the model:

$$x_i = f(t_i) + \epsilon_i$$

where: $f(t_i)$ is a continuous decreasing or increasing function of time and the residues ϵ_i are assumed to belong to the same distribution with an average value of zero.

Other scientific assessment methods are also applied

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

VI. SELECTED REFERENCES

Ministry of the Environment and Water. National Legislative documents – see above

EU Water Framework Directive (2013/39/EU) and related guidance documents

Basin Directorate Danube Region. National water management plan 2016-2021.

Basin Directorate Danube Region – Status and assessment reports for the Danube region.

Ministry of the Environment and Water, Executive Environmental Agency. 2017. Национален доклад за състоянието и опазването на околната среда (National report for ecological status of the Environment).

“АКВА-ENV” Consortium. 2017. Report „Проучване и оценка на химичното състояние на повърхностните води” (“Survey and assessment of surface water chemical status”)

Консорциум за интегрално управление на води. 2010. Доклад по обществена поръчка с предмет: Определяне на стандарти за качество за химичното състояние на повърхностните води. (Determination of quality standards for the surface water chemical status)