Interreg
Danube Transnational Programme
SIMONA

QUESTIONNAIRE FOR EXISTING SAMPLING, LABORATORY AND EVALUATION METHODS

Geological survey of Montenegro

0.1. Agency for Nature and Environment Protection of Montenegro
0.2. Institute of Hydrometerology and seismology of Montenegro

I.LEGISLATIVE FRAMEWORK

I.1Enumeration 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.	Zakon o vodama („Sl. list RCG“, br. 027/07 i „Sl. list CG”, br. 073/10, 032/11, 048/15, 052/16, 055/16, 02/17,084/18).	Water Act ("Official Gazette of RME", No. 027/07 and "Official Gazette ME", No. 073/10, 032/11, 048/15, 052/16, 055/16, 02/17,084/18).	https://epa.org.me/wp-content/uploads/2017/12/zakon-o-vodama.pdf	ME
2.	Zakon o geološkim istraživanjima ("Sl. list RCG", br. 28/93, 27/94, 42/94, 26/07, 28/11).	Law on Geological Explorations ("Official Gazette of the Republic of Montenegro", No. 28/93, 27/94, 42/94, 26/07, 28/11).	file:///C:/Users/Seven/Downloads/Zakon%20o%20geoloskim%20istrazivanjima.pdf file:///C:/Users/Seven/Downloads/Zakon_o_izmjenama_i_dopunama_Zakona_o_geoloA!kim_istraA3ivanjima%20(1).pdf	ME
3.	Zakon o životnoj sredini ("Sl. listu CG" 52/16)	Environmental Law of Montenegro ("Official Gazette of the Republic of Montenegro", No. 52/16.).	https://epa.org.me/wp-content/uploads/2017/12/zakon-o-zivotnoj-sredini.pdf	ME
4.	Zakon o zaštiti prirode (“Sl.list CG”, br. 54/16).	Law on Nature Protection ("Official Gazette of Montenegro", No. 54/16)	https://epa.org.me/wp-content/uploads/2017/12/zakon-o-zastiti-prirode.pdf	ME
5.	Zakonom o poljoprivrednom zemljištu ("Sl list RCG", br. 015/92, 059/92, 027/94, “Sl list CG", br. 073/10, 032/11)	The Law on Agricultural Land ("Official Gazette of RME", No. 015/92, 059/92, 027/94, ("Official Gazette of ME", No. 073/10, 032/11)	http://podgorica.me/db_files/Urbanizam/Zakoni/zakon_o_poljoprivrednom_zemljistu.pdf	ME
6.	Pravilnikom o dozvoljenim koncentracijama štetnih i opasnih materija u zemljištu i metodama za njihovo ispitivanje („Sl. list RCG“, br. 18/97).	Regulations on allowed concentrations of harmful and hazardous substances in soil and methods for their examination ("Official Gazette of RME", no.		ME

		18/97).		
7.	Pravilnik o higijenskoj ispravnosti vode za piće ("Sl. list SRJ", br. 42/98 i 44/99)	Regulations on hygiene direction of drinking water (Official Gazette of FRY", No. 42/98 and 44/99)	https://www.tehnologijahrane.com/pravilnik/pravilnik-o-higijenskoj-ispravnosti-vode-i	Yugoslavia
8.	Pravilnik o parametrima, provjeri usaglašenosti, metodama, načinu, obimu analiza I sprovođenju monitoring zdravstvene ispravnosti vode za ljudsku upotrebu (Sl.list Crne Gore, br.64/2018)	Ordinance on parameters, conformity assessment, methods, method, scope of analysis and implementation of health monitoring of water for human consumption (Official Gazette of Montenegro, No.64 / 2018)		ME
9.	Uredba o klasifikaciji i kategorizaciji površinskih voda u Crnoj Gori (Sl. i.27/07)	Regulation on Classification and Categorization of surface water and Groundwater in Montenegro (Official Gazette of Montenegro 27/07)	https://www.morskodobro.com/dokumenti/uredba_klasifikacija_kategorizacija_podzemnih_voda.pdf	ME
10.	Pravilnik o vrstama i kriterijumima za određivanje stanišnih tipova, načinu izrade karte staništa, načinu praćenja stanja i ugroženosti staništa, sadržaju godišnjeg izvještaja, mjerama zaštite i očuvanja stanišnih tipova (“Sl.list CG”, br. 80/08).	Rulebook on the types and criteria for determining habitat types, the way of mapping the habitat map, the way of monitoring the condition and endangering the habitat, the contents of the annual report, the measures for protection and conservation of habitat types ("Official Gazette of Montenegro", No. 80/08).	https://epa.org.me/wp-content/uploads/2017/12/pravilnik-080-2008.pdf	ME
11.	Pravilnik o bližem sadržaju godišnjeg programa monitoringa stanja očuvanosti prirode i uslovima koje mora da ispunjava pravno lice koje vrši monitoring("Sl. list CG", br. 35/10).	Rulebook on the content of the annual program of monitoring the state of conservation of nature and the conditions that must be met by a legal entity that performs monitoring ("Off. Gazette of Montenegro", no. 35/10).	https://epa.org.me/wp-content/uploads/2017/12/pravilnik-ii-035-2010-2.pdf	ME
12. A regulation for the maximum allowable concentration of pollutants in sediment in Montenegro does not exist. Also does not have laws, regulation or any other official directives for mentioned sample media, except the obligation to implement EU WFD in the next years.				

I.2List 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 triggeranadditional 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.

SOIL

Table 1. The maximum level of hazardous harmful substances in soils

No.	Trace Element	Maximum permissible concentrations in soils (mg/kg soils)
1.	Cd	2
2.	Pb	50
3.	Hg	1.5
4.	As	20
5.	Cr	50
6.	Ni	50
7.	F	300
8.	Cu	100
9.	Zn	300
10.	B	5
11.	Co	50
12.	Mo	10

Table 2. The maximum allowable amount of toxic and carcinogenic substances in the soil

No.	Trace Element	Maximum permissible concentrations in soils (mg/kg soils)
1.	PAHS	0.6
2.	PCB and PTC	0.004
3.	TBT and TMT	0.005

In order to monitor the state of the soil, ie to determine the content of hazardous and harmful substances in the land during 2017, sampling and analysis of the land from 19 locations were carried out, in 6 urban settlements in Montenegro, belonging to the Danube basin (Agency for Nature Protection and environment of Montenegro, 2018).

WATER

According to the "Ordinance on parameters, conformity assessment, methods, method, scope of analysis and implementation of health monitoring of water for human consumption (Official Gazette of Montenegro, No.64 / 2018)" this is trace element in drinking water.

Table 3. Metal trace elements in drinking water

No.	Trace Element	Unit of measure	Maximum permissible concentrations in drinking water
1.	Mercur (Hg)	µg/l	1.0
2.	As	µg/l	10
3.	Cd	µg/l	5.0
4.	Cr	µg/l	50.0
5.	Cu	mg/l	2.0
6.	Ni	µg/l	20.0
7.	Pb	µg/l	10.0
8.	Zn	µg/l	3.0
9.	Fe	µg/l	200

Table 4. Non-metal trace elements in drinking water

No.	Trace Element Non-metals	Unit of measure	Maximum permissible concentrations in drinking water
1.	F fluoride	mg/l	1.5
2.	Cl	mg/l	250
3.	SO_4^{-2}	mg/l	250
4.	Bromates	µg/l	25.0
5.	Bromate	µg/l	3.0

This decree sets out the classification and categorization of surface and groundwater on land and sea water in Montenegro, according "Regulation on Classification and Categorization of surface water and Groundwater in Montenegro (Official Gazette of Montenegro 27/07)".

According to the purpose of water, water is divided into water that can be used for:
- drinks and food industry;
- fishing and shellfish farming;
- bathing (other than pool water and water used for therapeutic purposes).

Table 5. The general division of water to class water (for drinking and food industry)

	Indicators	Units measures	A	A1	A2	A3
1	pH		6,80-8,30	6,80-8,50	6,50- 8,50	5,50-9,00
2	Color (after ordinary filtration)	mg/l Pt scale	5	5	10	20
3	Turbidity	NTU	1	5	5	10
4	Total suspended matter	mg/l	0	<10	20	50
5	Temperature	˚C	8-12	9-12	30	30
6	Electrolytic conductivity	µs/cm at 20˚C	300	400	600	1000
7	Mol ratio Ca/Mg	Mol	2-3	2-3	2-4	2-6
8	Odor (at 25˚C)	Dilution factor	< of the detection limit	< of the detection limit	3	10
9	Nitrates - NO3	mg/l	10	20	25	50
10	Nitrites - NO2	mg/l	< of the detection limit	0,003	0,005	0,02
11	Fluoride	mg/l	0,05	1	1,5	1,7
12	Dissolved iron	mg/l	0,05	0,1	0,3	1
13	Manganese-Mn	mg/l	< of the detection limit	0,005	0,01	0.05
14	Copper - Cu	mg/l	0,005	0,02	0,05	1
15	Zinc-Zn	mg/l	0,01	0,05	1	5
16	Boron-B	mg/l	0,5	1	1	1
17	Beryllium-Be	mg/l	0,001	0,001	0,005	0,05
18	Cobalt-Co	mg/l	0,001	0,001	0,010	0,050
19	Nickel-Ni	mg/l	0,002	0,002	0,050	0,100
20	Vanadium-V	mg/l	0,001	0,010	0,020	0,100
21	Arsenic-As	mg/l	0,001	0,010	0,050	0,050
22	Cadmium-Cd	mg/l	0,000	0,001	0,005	0,005
23	Total chrome	mg/l	0,000	0,000	0,05	0,05
24	Lead-Pb	mg/l	0,001	0,010	0,05	0,05
25	Selenium-Se	mg/l	0,001	0,001	0,010	0,010
26	Mercury-Hg	mg/l	< of the detection limit	< of the detection limit	0,0005	0,001
27	Barium-Ba	mg/l	0,1	0,1	0,7	1
28	Cyanides	mg/l	< of the detection limit	0,001	0,005	0,005
29	Sulphates	mg/l	20	20	50	200
30	Chlorides	mg/l	10	20	40	200
31	Uranus	µBq/l	0,000	0,010	0,050	0,050
32	Surface-active substances (react	mg/l	0,001	0,001	0,02	0,5

	with methyl blue)					
33	Ortho-phosphates	mg/l PO_4	0,01	0,02	0,05	0,10
34	Phenolic compounds	mg/l C_6H_5OH	0,0005	0,001	0,005	0,01
35	Total mineral oils	mg/l	< of the detection limit	0,01	0,05	0,5
36	PAHs	mg/l	< of the detection limit	0,0002	0,0002	0,001
37	Total pesticides	mg/l	< of the detection limit	< of the detection limit	0,001	0,0025
38	Chemical Oxygen Demand (COD)	mg/l O_2	1	2	4	8
39	Oxidability	mg $KMnO_4$/l	5	5	8	8
40	Degree of saturation of dissolved oxygen	% O_2	75	80-110	80-120	50-120
41	Biochemical Oxygen Demand (BOD_5)	mg/l O_2	2	3	4	7
42	Ammonium ion	mg/l	0,00	0,02	0,05	1
43	Matter extracted with chloroform	mg/l	< of the detection limit	0,01	0,2	0,5
44	Total organic carbon (TOC)	mg/l	1	1	2	2,5
45	Total coliforms 37˚C	/1ml	10	10	500	5000
46	Fecal coliforms	/100ml	10	20	2000	20000
47	Fecal streptococci	/100ml	< of the detection limit	20	1000	10000
48	Salmonella		It is not present in 5000 ml	It is not present in 5000 ml	It is not present in 1000 ml	It is not present in 1000 ml
49	Saprobity		Xeno-saprobic	Oligo-saprobic	ß-meso saprobic	ß-meso and a-meso saprobic
50	Index Saprobity		1,0	1,5	1,8	2,0

Water that can be used for drinking and the food industry is divided into four classes, namely:

1) Class A - Water that can be used for drinking in natural condition, with possible disinfection;
2) Class A1 - Water that can be used for drinking after a simple physical process of processing and disinfection;
3) Class A2 - water that can be used for drinking after proper conditioning (coagulation, filtration and disinfection);
4) Class A3 - Water that can be used after a treatment requiring intensive physical, chemical and biological treatment with extended disinfection and chlorination, i.e. coagulation, flocculation, decantation, filtration, active carbon absorption and ozone or chlorine disinfection.

Table 6. The general division of water to class water (for fish and shellfish farming)

	Indicators	**Units measures**	**S**	**Š**	**C**
1	Total suspended matter	mg/lSM	25	-	25
2	Nitrites - NO2	mg/l	<0,001	<0,03	<0,03
3	Phenolic compounds	mg/l C_6H_5OH	0,002	-	0,002
4	Degree of saturation of dissolved oxygen	% O_2	50% >9 100%>7	70%> 7	50%>8 100%>5
5	Ammonium ion	mg/l	0,04	-	1
6	Total coliforms 37˚C	/100ml	2000	100	10000
7	Fecal coliforms	/100ml	-	<300	-
8	Residual chlorine	mg/l	0	0	<0,005
9	Salinity	‰	-	<40	-
10	Organohalogenic Substances	mg/l	-	0,025	-

The waters that can be used for fisheries and shellfish breeding are classified into classes, namely:
1) Class S - Water that can be used for the production of precious fish species (salmonids);
2) Class S - water that can be used for shellfish farming;
3) Class C - Water that can be used for the cultivation of less precious species of fish (cyprinids).

Table 7. The general division of water to class water (for bathing water)

Water that can be used for swimming is divided into two classes, namely:

1) Class K1 - excellent,
2) Class K2 - Satisfactory.

a) for inland waters:

	Indicators	**Units measures**	**K1**	**K2**
1	Intestinal enterococci	/100ml	200	330
2	Escherichia coli	/100ml	500	900

b) for coastal sea water:

	Indicators	**Units measures**	**K1**	**K2**
1	Intestinal enterococci	/100ml	100	200
2	Escherichia coli	/100ml	250	500

III CLASSIFICATION AND CATEGORIZATION OF WATER BODIES

For the purpose of protecting and improving water quality, water bodies of surface and groundwater are classified into categories that meet the following conditions:
1) Category I - fresh water of classes A1, S and K1, and salty waters and classes Š;
2) Category II - Class A2, C and K2;
3) Category III - Class A3, as well as other waters that are out of the class for other purposes as defined by this Decree.

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.3Quality objectives for hazardous substances (please complete the tables of HSs according to national documents)

Dangerous substance (HS)	**Water quality objective (µg/l)**	**Quality target for sediment (mg/kg)**	**Quality objective for biocenosis (mg/kg)**
Cd	5 (max in drinking water)	-	-mollusks (as far as possible Mytilus edulis) and fish.
Hg	1.0 (max in drinking water)	-	0.3 mollusks and fish

I.4 Listing of analytical standards (national analytics and internationale.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	EPA7473 direct mercury analizer DMA	USEPA-Method 245.1.	
Mercury (Hg)in solids samples (sediments)	EPA7473 direct mercury analizer DMA	-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

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).

We couldn't find information about this.

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	sampling			MEST EN ISO 5667-1:2012 Sampling, Water Quality, Part 1 Guidelines for creating a sampling program and a sampling procedure. MEST EN ISO 5667-6:2017 Sampling, Water Quality, Part 6 Instructions for sampling from rivers and streams
2	Transport,storage			MEST EN ISO 5667-**3**:2013 Sampling, Water Quality, Part 3 Guidelines for the protection and handling of water samples.

All measurements of water quality monitoring are carried out within the Water Quality Testing Laboratory, which is accredited for sampling and chemical analysis according to the MEST EN ISO / IEC 17025: 2011 standard (Institute of Hydrometerology and Seismology of Montenegro).

I.7Specify 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

No.	Project title (national language, if available)	Project Title (EN)	Year	Country	Project coordinators,Partners
1.	Atlas geohemijskih karata Crne Gore	Atlas of geo-chemical maps of Montenegro	2009	Montenegro	Geological survey of Montenegro
2.	Osnovna geohemijska karta Crne Gore	Basic geochemical map of Montenegro	2009	Montenegro	Geological survey of Montenegro
3.	Istraživanje mineralnih sirovina u SR Crnoj Gori	Research of mineral resources in Montenegro	1976	Montenegro	United Nations and Geological survey of Montenegro
4.	Rizik od suše u regionu Dunava	Drought Risk in the Danube Region - DriDanube	On going	The Danube Transnational Programme-Interreg	Slovenian Environment Agency; Institute of Hydrometeorology and Seismology of Montenegro, etc.
5.	Jačanje kapaciteta u cilju implementacije Okvirne direktive o	Strengthening Capacities for Implementation of the EU Water Framework	On going	Montenegro	Water Directorate of Montenegro, Ministry of agriculture and Rural Development.

	vodama u Crnoj Gori	Directive in Montenegro			
6.	Podrška upravljanju vodnim resursima u slivu reke Drine	Water resource management in the Drina river basin Western Balkans	On going	Montenegro, Bosnia and Hercegovina, Serbia and Albania.	Project coordination in Montenegro is done throught the Ministry of agriculture and rural development.
7.	Plan upravljanja rizikom od poplava u slivu rijeke Save	Flood Risk Management Plan in the Sava River Basin - Sava FRMP	On going	Slovenia, Croatia, B&H, Serbia, Montenegro.	International Sava River Basin Commission. Project coordination in Montenegro is done throught Institute of Hydrometeorology and Seismology of Montenegro.

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

No.	Paper title (national language,ifavailable)	Title (EN)	Year	Country	Authors
1.	Procjena hidrohemijskih svojstava podzemnih voda u karstu.	Assessment of hydrochemical properties of groundwater in karst. International Conference and Field Seminar, Karst Without Boundaries, DIKTAS Project, Trebinje.	2014	Montenegro, BiH	Dević, N., Filipović, S.
2.	Hemijski status voda rijeke Lim. Magistarski rad. Prirodno matematički fakultet Podgorica. Univerzitet Crne Gore.	Chemical status of the river Lim. Master's thesis. Faculty of Natural Sciences and Mathematics, Podgorica. University of Montenegro.	2010	Montenegro	Nevenka Tomić
3.	Regionalno geohemijsko istraživanje potočnih sedimenata I ostala geohemijska ispitivanja u Sjeveroistočnoj Crnoj Gori tokom 1975. godine za Projekat Ujedinjenih nacija "Istraživanje mineralnih sirovina u SR Crnoj Gori".	Geochemical reconnaissance stream sediment survey and other geochemical investigations in northeasters Montenegro in 1975 for the United nations "Research of mineral resources in Montenegro"	1976	Montenegro	Marshall, N.J.
4.	Zemljišta Crne Gore kao resurs održivog razvoja. XI Kongres društva za proučavanje zemljišta Srbije i Crne Gore. Univerzitet Crne Gore – Biotehnički Institut, Centar za zemljište i melioracije/Društvo za proučavanje zemljišta	Montenegrin land as a resource for sustainable development. XI Congress of Serbian and Montenegrin Land Study Societies. University of Montenegro - Biotechnical Institute, Center for Land and	2005	Montenegro	Fuštić, B., Topalović, A., Knežević, N.M.

	Srbije i Crne Gore, Budva, 3-18.	Amelioration / Serbia and Montenegro Land Survey Society, Budva, 3-18.			
5.	Sadržaj teških metala u obradivim zemljištima ravničarskog dijela sjeverne Crne Gore. Poljoprivreda i šumarstvo, Vol..43 (3): 1-168.	The content of heavy metals in the cultivable land of the flat part of northern Montenegro. Agriculture and Forestry, Vol. 43 (3): 1-168.	1997	Montenegro	Radulović, M., Jakovljević, M., Perović, N.

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

Danube River Quality Monitoring Stations (site on rivers)

No.	Watercourse	Site	Site coordinates (North, East)*		Country
1	Lim	Plav	19°55'38.57"E	42°36'31.63"N	ME
2		Andrijevica	19°47'30.58"E	42°45'0.26"N	ME
3		Skakavac	19°52'3.44"E	42°53'57.54"N	ME
4		Zaton	19°44'42.88"E	42°59'26.95"N	ME
5		Bijelo Polje	19°45'48.27"E	43° 2'31.91"N	ME
6		Dobrakovo	19°46'33.03"E	43° 8'5.67"N	ME
7	Grncar	Gusinje	19°49'95,00"E	42°33'92,3"N	ME
8	Kutska Rijeka/Zlorečica	above Andrijevica	19°47'67,70"E	42°43'87,7"N	ME
9	Ibar	above Rozaje	20°08'67.70"E	42°49'65,2"N	ME
10		Bac	20°18'47,50"E	42°53'63,3"N	ME
11	Tara	Crna Poljana	42°46'58.38"N	19°32'31.50"E	ME
12		under Kolasin	42°49'46.64"N	19°30'54.59"E	ME
13		Trebaljevo	42°51'43.33"N	19°31'33.95"E	ME
14		under Mojkovca	42°57'44.46"N	19°34'11.33"E	ME
15		Djurdjevica Tara	43° 07'43.27"N	19°18'36.86"E	ME
16		Scepan Polje	43°20'54.44"N	18°50'24.63"E	ME
17	Piva	Scepan Polje	43°20'52.12"N	18°50'22.76"E	ME
18	Ćehotina	Rabitlija	43°18'46.78"N	19°23'16.64"E	ME
19		above Pljevlja	43°21'3.28"N	19°19'23.18"E	ME
20		Vezisnica	43°21'39.40"N	19°18'35.11"E	ME
21		Gradac	43°23'41.32"N	19° 9'0.70"E	ME
22	Vezišnica	Above the mouth	43°21'0,76"N	19°19'29,5"E	ME

* Data is downloaded from Google Maps (Source: Institute of Hydrometerology and seismology of Montenegro)

No.	Site coordinates (North, East) in WGS84 system (at least seven decimals points)	Project title (national languge)	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/state of current monitoring procedures in DRB

The information on the state of environment of Montenegro with the Proposal of Measures is one of the basic documents in the field of environment and it is issued annually.

The monitoring program is implemented by the institutions selected in the tender procedure, except for the monitoring of the quality of air implemented by D.O.O. "Center for Ecotoxicological Testing of Montenegro", based on the Decree on the Confidence of a Part of the Work under the Competence of the Agency for the Protection of Nature and the Environment.

The Water Quality Monitoring Program is proposed by the Ministry of Agriculture and Rural Development, which, in accordance with the Law on Waters, is implemented by the Institute of Hydrometeorology and Seismology of Montenegro. Water quality water testing on water intakes is carried out according to the annual program (in accordance with the aforementioned Law on Waters), which is adopted by the state administration body in charge of health affairs, with the previously obtained opinion of the Ministry and state administration bodies responsible for environmental affairs.

Pursuant to the Law on Environment, the program for monitoring the quality of drinking water is carried out by the authority responsible for health affairs, in accordance with special regulations. The annual report on the health correctness of drinking water is submitted by the competent body to the Agency for Nature and Environmental Protection.

Expert staff of the Agency for the Protection of Nature and Environment implements a biodiversity monitoring program from 2013 in the area of Montenegro.

The project entitled **"Strengthening Capacity for Implementation of the Water Framework Directive in Montenegro"** started in 2017 and will last for 3 years. The project will cover the whole territory of Montenegro, with a division into two main river basins, ie: the Danube River Basin with larger rivers: Piva, Tara, Ćehotina and Lim; and the Adriatic Basin with larger rivers: Zeta, Morača and Bojana. The main objective of this project is to enable the Ministry of Agriculture and Rural Development and other beneficiaries to prepare the ground for the implementation of the EU Water Framework Directive and all water related directives through the provision of an operational and efficient network for the monitoring and preparation of river management plans basins for the Adriatic and Danube basins.

The project, among other things, has the task of improving the water monitoring system in accordance with the WFD. This includes revision of existing monitoring parameters, location monitoring, proposal for new locations for surface water and groundwater as well as laboratory equipment for chemical and biological monitoring for surface waters, together with groundwater monitoring equipment and hydrological determination.

Harmonized monitoring of surface waters, in line with the EU Water Framework Directive, includes:
- Biological monitoring should cover five elements of biological quality: Fauna of benthic invertebrates, Phytoplankton, Phytobenthos, Macrophytes and Fish
- Monitoring of general physical-chemical parameters following biological monitoring: analysis of basic parameters of water quality such as pH value, temperature, oxygen level, alkalinity, salinity and nutrients;

● Monitoring of **hydromorphological elements** following biological monitoring: the quantity and dynamics of water flow, groundwater connection, river continuity, variation of river width and depth, ***structure and sediment of the bottom of the river***, structure of the coastal belt, etc.
● Chemical monitoring must include the analysis of 45 priority substances from the WFD as defined in the Environmental Quality Standards Directive (EQSD 2013/39/EU), taking into account Directive 2009/90 / EC laying down technical specifications for chemical analysis and monitoring status water in order to determine the chemical status.

The project is in the phase of implementation, development of new ones and amendments to the existing legal acts, as well as the establishment of water monitoring according to the WFD.

III.INVENTORY OF SAMPLING METHODOLOGIES

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?
Systematic testing of the quality of surface and groundwater in the territory of Montenegro is carried out in accordance with the Program on Systematic Testing of Quantities and Water Quality in Montenegro, which is adopted by the competent Ministry of Water Management, Forestry and Agriculture. The program defines a network of stations for water quality, as well as the scope, type and frequency of water quality tests.

III.1.2. Which parameters of water **quality**/**quantity** are measured ***in situ***?
Temperature, pH value, Electrolytic conductivity, Turbidity and alcalinity.

III.1.3. Which **instruments** are used for ***in situ*** measurements (include manufacturer and type)?
Thermometer with metal casing Schneider, pH meter WTW330i, Conductometer WTW340i, Turbidity meter WTW turb 430, pipeta grduis Isolab.

III.1.4. Please, describe **methodology** for ***in situ*** measurements.
Standard methods for the examination of water and wastewater, 14 th edition, USA, 1975.

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

III.1.6Sample preservation (samples chemical preservation according to their type and used analysis method).
Standard methods for the examination of water and wastewater, 14 th edition, USA, 1975.

III.1.7 Please, describe a **methodology** for collecting samples
Going directly to the field, there are no automatic stations for quality.

III.2 Sediment

We don't have monitoring of river sediment in Montenegro, but we have a lot experience across Projects (Geochemical reconnaissance stream sediment survey and other geochemical investigations in northeasters Montenegro in 1975 for the United nations "Research of mineral resources in Montenegro" and Basic geochemical map of Montenegro).

We must not forget that the northeastern part of Montenegro in a geomorphological view, the wide area around the river Cehotina, Lim and Ibra, and part of the upper Tara does not give a karstic look, but more terrains built from clastic sediments. The height of the terrain is fairly uniform and marks the old gulf in which the rivers flow through the dense network of their valleys, and these stairs gradually lowered to the present level, leaving the stages of former valleys in the form of floors (Bešić, 1969).

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

III. 2.2. Sampling design strategy. How do you choose sampling locations? How do you decide about temporal frequency of collecting samples?
III.2.3. Which parameters of sediment **quality**/**quantity** are measured ***in situ***?
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)?
III.2.7. Please, describe a **methodology** for collecting samples for **laboratory** measurements.
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**
Expert staff of the Agency for the Protection of Nature and Environment implements a biodiversity monitoring program from 2013, the locations of the monitoring program are different each year.

III.3.1. Which type(s) of **biota** do you sample/measure: **flora**, **fauna** (name species)?
The following organisms are collected: *Turbellaria, Hirudinae, Oligochaeta, crabs (Cladocera, Copepoda, Decapoda) and insects (Odonata, Placoptera, Trichoptera, Ephemeroptera, Diptera).*

III.3.2. Sampling design strategy. How do you choose sampling locations? How do you decide about temporal frequency of collecting samples?
The material is collected from March to November (all seasonal aspects) at sites of national importance, protected areas and NATURA 2000 habitats.

III.3.3. Which parameters of biota **quality**/**quantity** are measured ***in situ***?
On the site, the qualitative composition of the organism is registered.

III.3.4. Which **instruments** are used for ***in situ*** measurements (include manufacturer and type)?
Planktonic and "homemade" networks are used.

III.3.5. Please, describe **methodology** for ***in situ*** measurements.
The material is collected by nets or manually and fixed to the field with 4% formalin.

III.3.6. Which **tools** are used for collecting samples for **laboratory** measurements (include manufacturer and type)?
It uses the Olympus SZX10 binocular brand and the Olympus CX23 microscope.

III.3.7. Please, describe a **methodology** for collecting samples for **laboratory** measurements.
In the laboratory, a sample taken from the field is made of a membrane and poured into Petri cup, then observed under the binoculars and detailed records of the species. For some species it is necessary to separate them on the subject glass and look at them with a microscope.

III.3.8. Please, describe a **transport** methodology for samples intended for laboratory measurements.
Material taken in the field is placed in bottles (of different shape and size) and it is fixed with 4% formalin.

III.3.9. Do you **archive** samples? If yes, please describe how.
That the samples are stored in the bottle with the label on which the site is located and the date of sampling.

[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- analyzing the direct sample does not prepare a preliminary - unfiltered sample.
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

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

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.3Inventory 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.

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

IV.4Description 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.5Description of protocols for inter comparison and inter calibration between laboratories. List of national and internationals 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.4The environmental quality objectives are based on measuring the total metal concentration and / or some dangerous compounds of that metal in different valence states?
V.5How 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)]

VI. SELECTED REFERENCES:

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