QUESTIONNAIRE FOR EXISTING SAMPLING, LABORATORY AND EVALUATION METHODS

0.0. State your institution and country.
SE “Ukrainian Geological Company”
0.1. State institution(s) from which you got data to fill this questionnaire.

I.LEGISLATIVE FRAMEWORK

I.1Enumeration of national or European legislation (laws, governmental orders, emergency ordinances) that regulates the concentrations of dangerous substance sposing 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.

In Ukraine, the normative base of concentration limits of hazardous substances that poses a risk to the health of the population or aquatic biota in the environment (in soils, surface waters, drinking water, river deposits, seawater, sewage, medical mule, air and biota) is not developed enough. This applies both to the list of hazardous substances and to the list of environmental objects. Existing normative documents in their majority are analogues developed in the former USSR. The most complete are the maximum allowable concentrations taken for the air of populated areas and drinking water. Normative documents on the limits of concentration of hazardous substances in bottom sediments of rivers and lakes are absent. Regulatory documents on the limits of the concentration of dangerous substances in soils concern only agricultural lands, but they are often used to assess soil contamination in other types of land use (in cities, towns, parks, etc.).

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

No	Title (in national language)	Title (in English)	Link	Country
1	Державні санітарні правила охорони атмосферного по-вітря населених місць (від забруд-нення хімічними та біологічними речовинами). Наказ МОЗ України № 201 від 09.07.97	State sanitary regulationspro-tection of atmo-spheric air of inhabited places (from pollution by chemical and biological sub-stances) Order of the Ministry of Health of Ukraine No. 201 dated 07.09.1997	https://regulation.gov.ua/documents/id238138	UA

2	ДСанПіН 2.2.4-171-10 Гігієнічні вимоги до води питної, призначеної для споживання людиною Наказ МОЗ України № 400 від 12.05.10	State SanPin 2.2.4-171-10 Hygienic requirements for drinking water intended for human consumption Order of the Ministry of Health of Ukraine No. 400 dated May 12, 10	http://www.studmed.ru/download/dsanpn-224-171-10-ggyenchn-vimogi-do-vodi-pitnoyi-priznachenoyi-dlya-spozhivannya-lyudinoyu_384bdcbfb6c.html	UA
3	ДСТУ 4808:2007. Джерела централізованого питного водопостачання. Гігієнічні та екологічні вимоги щодо якості води і правила вибирання	DSTU 4808: 2007 Sources of centralized drinking water supply. Hygienic and environmental requirements for water quality and selection rules	http://library.dstu.education/indexing.php?r2=108175	UA
4	Гранично допустимі концентрації хімічних речовин у ґрунті (ГДК) 30.10.1980 N 2264-80	Maximum permissible concentrations of chemical substances in soil (MPC) 30.10.1980 N 2264-80	https://zakon.rada.gov.ua/laws/show/v2264400-80#o3	UA
5	Санитарные нормы ДОПУСТИМЫХ КОНЦЕНТРАЦИЙ ХИМИЧЕСКИХ ВЕЩЕСТВ В ПОЧВЕ СанПиН 42-128-4433-87	Sanitary standards ACCEPTED CONCENTRATIONS OF CHEMICAL SUBSTANCES IN SOIL	http://gostrf.com/normadata/1/4293852/4293852447.pdf	SU
6	СанПиН 4266-87 Методические указания по оценке степени опасности загрязнения почвы химическими веществами.	SanPin 4266-87 Guidelines for assessing the degree of hazard of soil contamination by chemicals. 13.03.1987	http://www.gostrf.com/normadata/1/4293852/4293852444.pdf	SU

	13.03.1987 Главный государственный санитарный врач СССР	*USSR Chief Public Health Officer*		
7	ДЕРЖАВНІ ГІГІЄНІЧНІ ПРАВИЛА І НОРМИ "Регламент максимальних рівнів окремих забруднюючих речовин у харчових продуктах" Наказ Міністерства охорони здоров'я України 13.05.2013 № 368	STATE Hygiene Rules and Norms "Regulation of maximum levels of individual pollutants in foodstuffs" Order of the Ministry of Health of Ukraine 05.13.2013 № 368	http://zakon5.rada.gov.ua/laws/show/z0774-13	UA

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 orin emissions/discharges, which, when reached, warn the competent authorities on a potential impact on environment and trigger an additional monitoring and/or reduction of pollutant concentrations in emissions/discharges.

Intervention threshold = concentrations of pollutants in air, water, soil or in emissions/discharges, which, when reached, determine the competent authorities to order risk assessment studies and reduction of pollutant emissions from emissions/discharges.
Each country, please deliver the definition of specific terms in the respective law.

Table 1 Metal trace elements in soils (*gross maximum allowable concentrations for agricultural soils - Ukraine*)

Trace Element	Levels in soils(mg/kg)					
Metals	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
Mercur (Hg)				2,1	2,1	
As				10	10	
Cd				4	4	
Cr				100	100	
Cu				32**	32	
Ni				100	100	
Pb				32**	32	
Zn				110	110	
Mn				1500	1500	
V				150	150	

*Refering to Normal values, for example, in Romania, there is a single set of **normal** values for all types of soils (probably an average value).Taking into account that some other countries could have more sets of normal values (depending on soil type, region etc.), more columns can be added in the table by the respective country.

In Ukraine, when performing ecological and geochemical soil studies, the normal values of the content of trace elements in soils are determined for the region of work in which research is conducted. Landscape-geochemical features of soils in different regions of Ukraine are different. The most reliable normal (background) values of the concentrations of heavy metals in soils of different parts of Ukraine (by the class of geochemical-landscape) were obtained during the implementation of the GEMAS program.

**- MPCPb,Cu is calculated as the sum of the normal (background) value for the soil of the region + 20 mg / kg. For example, the value of MPC Pb = 32 mg / kg was obtained from the amount of 12 mg / kg (clark in the earth's crust by A.P. Vinogradov, 1962) + 20 mg/kg.

Table 2 Metal trace elements in river water *(DSTU 4808:2007)*

Trace Element	Levels in river water(µg/l)					
Metals	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
Mercur (Hg)	<0,0002	0,0005	0,00051	0,0025	>0,0025	
As	<0,001	0,010	0,011	0,050	>0,050	
Cd	<0,0001	0,0005	0,0006	0,005	>0,005	
Cr (III)	<0,1	0,25	0,251	0,5	>0,5	
Cr (VI)	<0,004	0,01	0,011	0,05	>0,05	
Cu	<0,001	0,025	0,026	0,05	>0,05	
Ni	<0,02	0,05	0,051	0,1	>0,1	
Pb	<0,005	0,02	0,021	0,1	>0,1	
Zn	<0,01	0,1	0,101	1,0	>1,0	
Al	<0,05	0,2	0,201	0,5	>0,5	
Ba	<0,1	1,0	1,01	2,0	>2,0	
Be	<0,0002	0,002	0,0021	0,004	>0,004	
B	<0,1	0,2	0,201	4	>4	
Br	<0,1	0,2	0,201	0,5	>0,5	
V	<0,002	0,01	0,011	0,02	>0,02	
Fe (tot.)	<0,05	0,1	0,101	1,0	>1,0	
Co	<0,01	0,02	0,021	0,05	>0,05	
Li	<0,01	0,05	0,051	0,1	>0,1	
Mn	<0,01	0,1	0,101	1,0	>1,0	
Mo	<0,001	0,025	0,026	0,2	>0,2	
Se	<0,0015	0,005	0,0051	0,01	>0,01	
Sb	<0,0001	0,0005	0,0006	0,001	>0,001	
Tl	<0,0001	0,0005	0,0006	0,002	>0,002	
F	<0,7	1,0	1,001	1,5	>1,5	

Table 3 Metal trace elements in drinking water *(DSTU 4808:2007)*

Trace Element	Levels in drinking water(µg/l)					
metals	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
Mercur (Hg)	<0,0005	0,001	0,0011	0,002	>0,002	
As	<0,001	0,02	0,021	0,05	>0,05	
Cd	<0,001	0,002	0,003	0,004	>0,004	
Cr (III)	<0,1	0,2	0,201	0,5	>0,5	
Cr (VI)	<0,01	0,02	0,021	0,05	>0,05	
Cu	<0,001	0,002	0,0021	0,003	>0,003	
Ni	<0,02	0,05	0,051	0,1	>0,1	
Pb	<0,01	0,03	0,031	0,1	>0,1	
Zn	<0,1	0,5	0,501	1,0	>1,0	
Al	<-	<0,5	0,5	2,0	>2,0	
Ba	<0,1	0,2	0,201	1,0	>1,0	
Be	<0,0002	0,001	0,0011	0,002	>0,002	
B	<0,2	0,5	0,501	1,0	>1,0	
Br	<0,01	0,025	0,026	0,1	>0,1	
V	<0,01	0,05	0,051	0,1	>0,1	
Fe (tot.)	<0,3	1,0	1,001	2,0	>2,0	
Co	<0,01	0,05	0,051	0,1	>0,1	
Li	<0,01	0,02	0,021	0,03	>0,03	
Mn	<0,05	0,1	0,101	0,5	>0,5	
Mo	<0,2	0,3	0,301	0,5	>0,5	
Se	<0,001	0,01	0,011	0,015	>0,015	
Sb	-	<0,01	0,01	0,02	>0,02	
Tl	-	<0,0005	0,0005	0,001	>0,001	
F	<0,7	1,0	1,001	1,5	>1,5	

Table 4 Non-metal trace elements in soils

Trace Element	Levels in soils (mg/kg)					
Non-metals	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	0,7	1,0	1,001	1,5	>1,5	
Cl						
S						
Br	0,1	0,2	0,201	0,5	>0,5	
I						
CN	<0,001	0,01	0,011	0,05	>0,05	
Ba	<0,1	1,0	1,01	2,0	>2,0	
Se	<0,0015	0,005	0,0051	0,01	>0,01	
Sb	<0,0001	0,0005	0,0006	0,001	>0,001	

Table 5 Non-metal trace elements in river and drinking water

Trace Element	Levels in river *and drinking* water(µg/l)					
Non-metals	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	0,7	1,0	1,001	1,5	>1,5	
Cl						
S						
Br	0,01	0,025	0,026	0,1	>0,1	
I						
CN	-	<0,01	0,01	0,05	>0,05	
Ba	<0,1	0,2	0,201	1,0	>1,0	
Se	<0,001	0,01	0,011	0,015	>0,015	
Sb	-	<0,01	0,01	0,02	>0,02	

Table 6 Radionuclides in river and drinking water

Trace Element	Levels in river and drinking water (Bq/dm^3)					
Radionuclides	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
^{90}Sr	<2	<2	<2	<2	<10	
^{137}Cs	<2	<2	<2	<2	<100	
∑ natural isotopesU	<1	<1	<1	<1	<1	
^{226}Ra	<1	<1	<1	<1	<1	
^{228}Ra	<1	<1	<1	<1	<1	
^{222}Rn	<100	<100	<100	<100	<100	
^{3}H (tritium)	<3000	<3000	<3000	<3000	<3000	

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

Trace Element	Levels in river water (µg/l)					
Organic matter	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
Benz (a) pyrene	<0,00001	0,0007	0,00071	0,005	>0,005	
Benzene, xylene, toluene	<0,005	0,03	0,031	0,07	>0,07	
Ethylbenzene	<0,0005	0,002	0,0021	0,005	>0,005	
Petroleum products (general, hydrocarbons)	<0,01	0,05	0,051	0,2	>0,2	
Chlororganic pesticides (amount)	<0,0001	0,001	0,0011	0,005	>0,005	
Synthetic surfactants	<0,01	0,05	0,051	0,250	>0,250	
Tetrachlorobenzene	<0,0005	0,002	0,0021	0,005	>0,005	
Tetrahlor Carbon	<0,0005	0,002	0,0021	0,006	>0,006	
Trihalomethanes (sum of chloroform + dibromochloromethane + dichlorobromethane)	<0,05	0,1	0,101	0,2	>0,2	
volatile phenols	<0,001	0,01	0,011	0,05	>0,05	
Chlorphenols	<0,0003	0,0005	0,0006	0,001	>0,001	

Trace Element	Levels in drinking water(µg/l))					
Organic matter	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
Benz (a) pyrene	<0,00001	0,0007	0,00071	0,005	>0,005	
Petroleum products (general, hydrocarbons)	-	<0,02	0,02	0,05	>0,05	
Chlororganicpesticides (amount)	<0,0001	0,0002	0,0003	0,0005	>0,0005	
Synthetic surfactants	-	<0,01	0,01	0,05	>0,05	
Tetrahlor Carbon	<0,0001	0,001	0,0011	0,002	>0,002	
Trihalomethanes (sum of chloroform + dibromochloromethane + dichlorobromethane)	<0,01	0,02	0,021	0,05	>0,05	
volatile phenols	-	<0,001	0,001	0,002	>0,002	
Chlorphenols	-	-	-	-	-	

Trace Element	Levels in river water(µg/l)					
Microbiological indicators	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
Total microbial number (CFU / cm3)	tens	hundreds	thousands	tens of thousands	tens of thousands	
Common coliforms (lactose-positive intestinal bacteria) index BGKP, not more (CFU / dm3)	100	1000	10000	50000	>50000	
Thermostable intestinal bacteria (TIB), index (CFU / 100dm3)	absence	50	500	1000	>1000	
The presence of pathogenic enterobacteria	absence	absence	absence	Availability/absence	Availability	

(salmonella, shigella) (presence / dm3)						
coliphages, plain-forming units/dm3	absence	10	100	1000	>1000	
Enteroviruses, adenoviruses and antigens of rotavirus, revirus and hepatitis A viruses (presence / dm 3)	absence	absence	absence	Availability/absence	Availability	

Trace Element	Levels in drinking water(µg/l))					
Microbiological indicators	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
Total microbial number (CFU / cm^3)	tens	hundreds	Thou-sands	tens of thousands	tens of thousands	
Common coliforms (lactose-positive intestinal bacteria) BGKP index, not more (CFU / dm3)	absence	absence	1	10	100	
Thermostable intestinal bacteria (TKB), index (KUO/100dm3)	absence	absence	absence	absence	absence	
The presence of pathogenic enterobacteria (salmonella, shigella) (presence / dm3)	absence	absence	absence	absence	absence	
coliphages, plain-forming units/dm3	absence	absence	absence	absence	absence	
Enteroviruses, adenoviruses and antigens of rotavirus, hepatitis A viruses and viruses (presence / dm3)	absence	absence	absence	absence	Availability /absence	

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

Dangerous substance	Water quality objective (µg/l)	Quality target for sediment (mg/kg)	Quality objective for biocenosis (mg/kg)
Cd	0,005	unavailable	1,0 mollusks (Mytilusedulis) and 0,05 fish.
Hg	0.0025	unavailable	0.3 mollusks and fish 0,5 predatoryfish
Pb	0,1	unavailable	1,5 -mollusks i 0,3 – 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

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 do not have information on the availability of nationally-based tests for chronic or acute toxicity and bioaccumulation.

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	DSTU ISO 5667-12-2001 http://online.budstandart.com/ru/catalog/doc-page.html?id_doc=64553	DSTU ISO 10381-1:2004 https://www.google.com/search?client=firefox-b-ab&ei=- DSTU ISO 10381-2:2004 http://online.budstandart.com/ru/catalog/doc-page?id_doc=58855 Environmental quality, sampling of soils and wastes on the implementation of chemical and analytical control of spatial (general and local) pollution of objects of the environment in areas of influence of industrial, agricultural, household and transport sources of pollution. Instruction. Ministry of Ecology and Natural Resources of Ukraine, 2005 http://online.budstandart.com/ua/catalog/doc-page?id_doc=58813	DSTU ISO 5667-6:2009 http://online.budstandart.com/ua/catalog/doc-page.html?id_doc=64511
2	Transport, storage	DSTU ISO 5667-15:2007 http://metrology.com.ua/download/iso-iec-ohsas-i-dr/61-iso/943-dstu-iso-5667-15-2007	DSTU ISO 11464:2007 http://metrology.com.ua/download/iso-iec-ohsas-i-dr/61-iso/982-dstu-iso-11464-2007	DSTU ISO 5667-3-2001 http://online.budstandart.com/ua/catalog/doc-page.html?id_doc=54648

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 information available

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

No information available

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

Hydrometeorological stations coordinates in Ukraine (Zakarpattia Oblast).
Basin department of water resources of the Tysa river

№ з/п	Station name (ukr)	Station name (eng)	River name (ukr)	River name (eng)	Longitude, WGS-84	Lattitude, WGS-84
1	**Підполоззя**	Pidpolozzia	р. Латориця	r. Latorytsia	23.021000	48.743400
2	**Поляна**	Poliana	р. Пінія	r. Piniia	22.963200	48.612600
3	Свалява	Svaliava	р. Латориця	r. Latorytsia	22.979900	48.552900
4	Мукачево	Mukachevo	р. Латориця	r. Latorytsia	22.716100	48.443100
5	Чоп	Chop	р. Латориця	r. Latorytsia	22.205710	48.453410
6	**Т.Поляна**	Turia. Poliana	р. Тур'я	r. Turia	22.799600	48.699100
7	Загонь	Zahony	р. Тиса	r. Tysa	22.172800	48.412700
8	Жорнава	Zhornava	р. Уж	r. Uzh	22.629300	48.989400
9	В. Березний	Velykyi Bereznyi	р. Уж	r. Uzh	22.465100	48.897300
10	Чорноголова	Chornoholova	р. Люта	r. Liuta	22.605400	48.858600
11	Зарічево	Zarichevo	р. Уж	r. Uzh	22.499400	48.770300
12	Сімер	Simer	р. Тур'я	r. Turia	22.514800	48.734100
13	Ужгород	Uzhhorod	р. Уж	r. Uzh	22.300000	48.621400
14	Довге	Dovhe	р. Боржава	r. Borzhava	23.285900	48.366700
15	Н. Ремета (Ни́жні Реме́ти)	Nyzgni Remety	р. Боржава	r. Borzhava	22.816200	48.245100
16	Тісабеч	Tiszabecs	р. Тиса	r. Tysa	22.828300	48.103600
17	Репинне	Repbhhe	р. Репинка	r. Repinka	23.444600	48.587200
18	Міжгір'я	Mizhhiria	р. Ріка	r. Rika	23.503800	48.526900

19	Пилипець	Pylypets	р. Пилипець	r. Pylypets	23.338100	48.670400
20	Хуст	Khust	р. Ріка	r. Rika	23.268300	48.180100
21	Крива	Kryva	р. Тиса	r. Tysa	23.256300	48.175300
22	Колочава	Kolochava	р. Теребля	r. Tereblia	23.675600	48.406600
23	Тячів	Tiachiv	р. Тиса	r. Tysa	23.575800	48.005100
24	Усть-Чорна	Ust-Chorna	р. Тересва	r. Teresva	23.928600	48.330100
25	Нересниця	Neresnytsia	р. Тересва	r. Teresva	23.769100	48.114400
26	Солотвино	Solotvino	р. Тиса	r. Tysa	23.871800	47.937200
27	В. Бичків	Velykyi Bychkiv	р. Тиса	r. Tysa	24.005600	47.968000
28	Ділове	Dilove	р. Тиса	r. Tysa	24.173800	47.935700
29	К. Поляна (Кобилецька?)	Kosivcka Poliana	р. Косівська	r. Kosivcka	24.110265	48.040800
30	Рахів	Rahiv	р. Тиса	r. Tysa	24.205100	48.052800
31	Луги	Luhy	р. Біла Тиса	r. Bila Tysa	24.415600	48.058800
32	Ясіня	Yasinia	р. Чорна Тиса	r. Chorna Tysa	24.358600	48.272700
Water Quality Station						
33	Тячів	Tiachiv	р. Тиса	r. Tysa	23.575000	48.005100

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 theHSs biological effects, evidence of impact of anthropogenic activities.

There are no information

II.5.Problems of current monitoring procedures in DRB

The monitoring of the current status of the Danube water basin in Ukraine along the Tisza River is carried out by the Basin Department of the water resources of the Tisza River. Monitoring refers to measurements of surface water levels in the rivers of the Tisza river basin. Monitoring of the hydrochemical composition of surface water is also carried out, but we do not know the list of characteristics to be controlled.
http://buvrtysa.gov.ua/newsite/?page_id=107

In the framework of the implementation of the measures of the Regional Target Program for the Development of the Water Economy and the Environmental Health Improvement of the Tis River Basin in the Transcarpathian Region for 2013-2021, in October-November 2018, employees of the Berehovo Municipal Management and Maintenance Department carry out shore-fence.
In the framework of the agreement between the Ministry of Water Management of the Ukrainian SSR and the State Agency of Water Resources of the Hungarian People's Republic on the topic "Information and measurement system for flood forecasting and water resources management in the river basins " (Budapest, 16.12.1986), in 2000, the creation of an automated information and measurement system for forecasting floods and water resources management in the Tisza River Basin (AIVS-Tisza) was launched.
With assistance from the Government of Hungary, eight hydrological stations in the Tisza basin were built and put into operation in the Transcarpathian region (Kryva village, Khust district, Tysa river; Tiachi village, Tisza river; Rakhiv,Tisza river; Dovga village, Borzhavariver; Mizhhirya village, Rikariver;Kolokhava village, Tereblyariver;Ust-Chorna village, Teresva river;Luga village, Belaya Tisza river; Yasinya village ChornaTysa river) and 2 automated hydrometeorological measuring stations. in the upper reaches of the Tisza River (V. Bichkov village on the Tisza River;N.Remetavillage,Borzhava river.)
In 2014-2020, meetings of cross-border cooperation committees on Hungary-Slovakia-Romania-Ukraine cross-border cooperation committees are held. The last one was on 11/27/2018

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?

Sampling planning is carried out according to DSTU ISO 5667-1: 2003, DSTU ISO 5667-2: 2003, DSTU ISO 5667-3: 2001, DSTU ISO 5667-4: 2003, DSTU ISO 5667-6: 2001

III.1.2. Which parameters of water **quality**/**quantity** are measured ***in situ***?
Our company does not measure the parameters of water in situ.
III.1.3. Which **instruments** are used for ***in situ*** measurements (include manufacturer and type)?
There are no such instruments in our enterprise.
III.1.4. Please, describe **methodology** for ***in situ*** measurements.
Our company does not measure the parameters of water in situ
III.1.5. Which **tools** are used for collecting samples for **laboratory** measurements (include manufacturer and type)?
Polyethylene buckets of own manufacture.
III.1.6 Sample preservation (samples chemical preservation according to their type and used analysis method).

According to DSTU ISO 5667-3: 2001
III.1.7 Please, describe a **methodology** for collecting samples
On small rivers (such as the river Tisza and its tributaries on the territory of Ukraine), surface water samples are taken from the middle of the stream (if possible) by a polyethylene drawer and poured into pre-prepared (flushed by distilled water and then by flowing water) glass containers for various types of analytical studies . The samples for the determination of heavy metals are preserved with concentrated HNO3- at the rate of 5 ml of acid per 1 liter of water (roughly up to pH <2). Selected water samples are taken to the laboratory within 1-2 days.

III.2 Sediment
III.2.1. Which type(s) of sediment do you sample/measure **bottom**, **suspended**, **floodplain**?
During ecological and geochemical studies of bottom sediments, water flow sites with oozy sediments are selected, which in most cases (if there are man-made sources of water flow contamination) correspond to the so-called "man-made" sediments (oozy fraction - <0.1 mm, most fully concentrates chemical pollution elements).
III.2.2. Sampling design strategy. How do you choose sampling locations?
How do you decide about temporal frequency of collecting samples?

We choose sampling locations according to DSTU ISO 5667-12-2001. For sampling of bottom sediments in the watercourse, places are selected in which sludge deposits are accumulated (entrance to bays, places behind the banks with backflow, etc.). Sampling takes place during the summer low water period once a year.
III.2.3. Which parameters of sediment **quality**/**quantity** are measured ***in situ***?
Our company does not measure the parameters of water 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)?
We have not such sampling devices.
III.2.5. Please, describe **methodology** for ***in situ*** measurements.
At our enterprise, such methodology are not used.
III.2.6. Which **tools** are used for collecting samples for **laboratory** measurements (include manufacturer and type)?

With a thickness of silt and sandy sediments up to 0,2-0,3 m, we use a plastic scoop, or a stainless steel blade. With a thickness of mud deposits of 0.3 - 3.0 m, the Giller peat drill is used
III.2.7. Please, describe a **methodology** for collecting samples for **laboratory** measurements.
According to DSTU ISO 5667-12-2001, an average sample of 5 sample points is prepared.
III.2.8. Please, describe a **transport** methodology for samples intended for laboratory measurements.
An average sample of not less than 0.5 kg is made up of a white cloth bag marked with a label. The sample will be dried at a well ventilated room (under a canopy) at ambient temperature and swept through during drying. After

drying, the sample is sifted through a nylon sieve with a diameter of 1 mm, quarted and broken into laboratory samples and a duplicate. Laboratory tests are placed tracing paper bag with the necessary markings.
III.2.9. Do you **archive** samples? If yes, please describe how.
Duplicate samples are stored in a kraft paper bag or polyethylene container with the appropriate markings in a dry, cool room.

III.3.Biota

III.3.1. Which type(s) of **biota** do you sample/measure: **flora**, **fauna** (name species)?
Our enterprise does not take biota samples.
III.3.2. Sampling design strategy. How do you choose sampling locations? How do you decide about temporal frequency of collecting samples?
Does not apply
III.3.3. Which parameters of biota **quality/quantity** are measured ***in situ***?
Does not apply
III.3.4. Which **instruments** are used for ***in situ*** measurements (include manufacturer and type)?
Does not apply
III.3.5. Please, describe **methodology** for ***in situ*** measurements.
Does not apply
III.3.6. Which **tools** are used for collecting samples for **laboratory** measurements (include manufacturer and type)?
Does not apply
III.3.7. Please, describe a **methodology** for collecting samples for **laboratory** measurements.
Does not apply
III.3.8. Please, describe a **transport** methodology for samples intended for laboratory measurements.
Does not apply
III.3.9. Do you **archive** samples? If yes, please describe how.
Does not apply

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

IV.INVENTORY OF LABORATORY METHODOLOGIES

IV. Обладнання для лабораторних досліджень

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

a) water
b) sediment
c) biota?

Samples of bottom sediments is dried in white linen bags in a well ventilated room. During the drying process, the samples are malaxated manually. The samples sieve on a nylon sieve 1-2 mm after drying, quarter and select laboratory samples.. Laboratory samples are rubbed in an agate mechanical mortar to 0.071 mm (200 mesh.).

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 equipment.
Description of internal procedures
DSTU B V.2.1-19: 2009 Granulometric sieve without water (grain) and micro aggregate state (areometric method).
DSTU CEN ISO / TS 17892: 2007;
DSTU B V.2.7-232: 2010;
DSTU B V.2.7-131: 2007;
DSTU B V.2.7-71-98.

IV.2.1. Organic matter. What is the **procedure** for **organic matter** content determination in water and sediment?
MM (measurement methodology) 99-12-98 (petroleum products); DSTU ISO 7875-1: 2012, MM 105-12-98 (surface-active substances); DSTU ISO 6468-2002 (chlororganic substances), DSTU ISO 17993: 2008 (polycyclic aromatic hydrocarbons), MM 104-12-98 (phenols - Fluorate-02 analysers), DSTU ISO 5814-2003 (ISO 5814: 1990, IDT) (soluble oxygen); DSTU ISO 5815-1: 2009 (biochemical oxygen consumption),

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

There are no ICP-MS, ICP-AES in the laboratory of the enterprise.
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.
TERMOSIENIFICSOLAAR 6M (England)
Determination of the content of chemical elements on AASsystems: Hg (DSTU ISOO16772: 2005 (ISO 16772: 2004, IDT) AAS Coldvapors; Pb, Cd, Cr, V, Mn, Co, Ni, Cu, Zn, Mo, Ti, Asi, etc. (DSTU ISO 15586: 2012; ISO 15586: 2003, IDT) - AAS-ETA; AAS-Flame, Spectrophotometric.
IV.2.3.2. Which **elements (HSs)** do you measure by AAS? Please, state **detection limits** for measured elements (HSs).
Al-0.001 mg / l; Cd-0,0002 mg / l; Co-0.06 mg / l; Cu-0,01 mg / l; Mo-0,001 mg / l; As-0,001 mg / l; Ni-0,001 mg / l; Pb-0,0005 mg / l; Se-0,001 mg / l; Ag-0,0001 mg / l;
Cr-0,001 mg / l; Mn-0,001 mg / l; V-0.002 mg / l; Sb-0.002 mg / l; Ba-0.1 mg / l; Be-0,0001 mg / l; B-0.05 mg / l;
Cd-0.0005 mg / kg; Co-0.005 mg / kg; Cu-0,0005 mg / kg; Ni-0.005 mg / kg; Pb-0,001 mg / kg; Vi-0.0025 mg / kg

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)?
According to the JMA 73.1-41-08.00.01: 2004

IV.2.4. XRF

There are a few standard samples (the method is applicable only to rocks) in the laboratory of the company

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

Our laboratory does not use this method

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.

Water: QUANTULUS-1200 spectrometer DSTU ISO 9696-2001 (H3, Rn222, Ra226, Ra228, U, β, α); Radiometer of alpha-active gases РГА 03 (Альфа - 1М). ISO 13165-1: 2013 (Ra226, U); "Instruction and methodological guidelines for the assessment of the radiation situation in the contaminated area" Goscomgidromet of the USSR, August 17, 1989 (Sr90)

Bottom sediments, soils and biota: gamma-spectrometric complex based on the multichannel analyzer NOKIALP 490 with a semiconductor detector of the type DGDK-220 (226Ra, 232Th, 40K, 137Cs, 134Cs and others)

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.2.6.3. Як обчислюєте **точність, помилки** визначення (посилання)?
According to the JMA 73.1-41-08.00.01: 2004

IV.2.7. Organic compounds (HSs)

IV.2.7.1. **Which instrumental method(s)** do 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
Our laboratory does not use this method
IV.2.8.1. Please, state manufacturer and type of XRD instrument you use.
IV.2.8.2. Do you use **XRD for sediment analysis**?
IV.2.8.3. Please, describe **preparation of the sample and procedure** for XRD measurements

IV.3 Inventory of national laboratories where dangerous substances are analyzed, specifying whether they have accreditations on the quality of analyzes (certificate issued by the national body attesting the quality of the analyzes),price and time of analyses.
The Laboratory has a Certificate of Certification of the State Service of Geology and Subsoil of Ukraine No. 061/2012 dated March 1, 2012 and valid until March 1, 2019, and Certificate of Recognition of Measuring Capabilities No. PT / 17 dated March 22, 2017
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.5Description of protocols for inter comparison and inter calibration between laboratories. List of national and internationals projects which had developed the Protocols.
The laboratory is undergoing external interlaboratory control in Ukraine

[PLEASE, SUPPORTYOURANSWERSWITHREFERENCES (NATIONALLEGISLATIVEDOCUMENTSAND/ORWEBLINKS)]

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?
To estimate the level of contamination, the gross concentrations of elements in the bottom sediments are mainly used; sometimes for Cr the estimation based

on the valence value is used, this is done in the case when Cr is the leading contamination element

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

Ukrainian legislation does not reflect the phenomenon of bioaccumulation. Only the method of MPC for the toxic elements in food products is used. V.6. Does your national legislative find **categories of environment quality** based on deviations from threshold values?

Only for drinking and surface waters which provide for the water supply of the population.

V.7. Can these categories be **defined by quality of more than one medium?** There are methods for a complex environmental assessment, but they are not official (not approved at the state level).

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

In the practice of ecological and geochemical research in the past of the USSR and today among the geochemists in Ukraine for assessing the pollution of rivers a methodology based on the intensity of the accumulation of chemical elements in bottom sediments and water is used (Yanin E.P., Technogenic geochemical associations in the bottom sediments of small rivers, M., IMGRE, 2002. 52c.)

In connection with the polyelemental nature of technogenic contamination of bottom sediments, to determine their total contamination by heavy metals, a method is used which involves the calculation of the total indicator (the sum of the coefficients of the concentration of anomalous chemical elements) of the accumulation of chemical elements (Zc) with a subsequent comparison of this indicator with the scale of contamination levels (Table).

In turn, the overall indicator of the accumulation of chemical elements, or the total pollution factor (Zc), was calculated by the formula:

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

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

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

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

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

For emissions of enterprises into the atmosphere or discharges into the reservoir establish limits for concentrations of harmful substances. Concentration limits are calculated based on special programs that take into account possible scattering of the substance in the environment, which does not lead to excess of the MPC of harmful substances in the air or surface waters. These limits significantly (tenfold) exceed the background content of this substance in the environment.

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

The geochemical association of pollution elements and their concentration in environmental objects (mainly in soils and bottom sediments) identifies the source of emissions (there are certain geochemical associations for emissions of major types of industrial enterprises in Ukraine and Russia). Such a technique is also not formally adopted at the state level.

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

Informing state environmental authorities

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?

Results of ecological-geochemical studies in reports are provided for target groups. The report includes a methodology and full results. These results are open to everyone.

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

Methods of space-time risk assessment after the detection of pollution are used in the practice of ecological and geochemical research. Mainly, these are modelling and forecasting methods, but they are not perfect.

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

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