ON STATE MONITORING OF FLUVIAL WATER QUALITY OF TYSA`S BASIN IN THE FRESHET SEASON

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***Abstract*:** The state monitoring of fluvial waters quality of Tysa`s basin is reviewed. The measures of quality control of fluvial waters in a time of high water are offered in network of Committee for Water Management and Committee for Hydrometeorology.
***Keywords*:** monitoring, Tysa, fluvial, quality, Carpathian, condition, freshet, hydrochemical.

ÜBER STAATLICH MONITORING DER QUALITÄT DER FLUSSWÄSSER DES BASSINS DIE TYSA IM LAUFE VON DEM HOCHWASSER.

***Zusammenfassung*:** Ist staatlich monitoring der Qualität der Flusswässer des Bassins die Tysa untersucht. Die Qualitätsüberwachung des Wassers im Laufe von dem Hochwasser in das Netzwerk des Komitees nach dem Wassermanagement und des Komitees Hydrometeorologesthe.
***Schluesselworte*:** monitoring, Tysa, fluss-, die Qualität, karpaten-, den Zustand, das Hochwasser, hydrochemie die Analyse.

In accordance with main conditions of “The Convention on the protection and use of transboundary watercourses and international lakes” which was signed in Helsinki in March 1992 (Ukraine joined it in 1999) installation of up-to-date monitoring network and use of efficient control of water quality can be considered as the priority tasks as at the national, as at international levels. These are the most important tasks of the environmental safety. These tasks include decreasing of pollution of transboundary water sources, freshet control, setting up of accident emergency warning system for minimizing of negative impact.

The efficient monitoring and water quality control of transboundary Carpathian Rivers, such as Tysa, Uzh and Latoritsa, are among the most actual Ukrainian problems.

It has a link with high frequency of changes of effluent characteristics, high range of water rate fluctuation in short time period, significant anthropogenic impact on water quality and difficult hydrochemical regime.

In 2001 on the task of the Ministry “The scheme of complex protection against fluvial waters in the Tysa River (Carpathian region) is being developed (the institute “Ukrvodproekt” was the main organization). The working out of the scheme was accompanied by scientific ground of the methods of protection against freshet, mudflow, upheaval. At the same time the analysis of form and develop hydrometeorological condition of extremely freshet in Carpathian region was made; recommendation of protection methods against freshet effect was examined; the stabilizing role of forests in case disasters in Carpathian region was estimated; the methods of river-bed process regulation and river water quality estimation in freshet condition were grounded; the economical and ecological ground of methods against freshet was developed.

When we learnt questions connected with river water quality estimation, we analyze condition of state monitoring in the Committee for Water Management and the Ministry of ecology and natural resources of Ukraine. We proposed to make the series of high-priority means for control of river water quality in freshet period. Among this means we should call the next.

1. To make the audit and optimization of basic monitoring system of surface water in Tysa basin. This monitoring is made by the Committee for Water Management, the Ministry of ecology and natural resources, the Ministry of health safety and other ministries and departments.

2. To develop and realize the methods of organization and practical use of effective interaction between organizations, which are making monitoring control in case of natural and anthropogenic accident situation on the rivers in the Carpathian region.

3. To develop and provide the necessary methods of making systematic and complex hydrochemical researches on the active stations in the Tysa River basin. The research works have to be carried out in accordance with the programs and the lists of ingredients (Tables. 4 and 5).

At same time we should take into account that today to define some ingredients, especially of specific ingredients (Tables 3-5) is connect with logical difficulties and high financial expenses. Therefore, then we grounded the list of specific ingredients, which priority and representativity we should take into account. The definite approvement of hydrochemical tests (their terms, frequency and continuance) should be also taken into account.

When we want to open the new water quality observation station, we should base on the present normative acts of the Ministry of ecology and natural resources and the Committee for Water Management, which define and institutionalise the department aims and tasks in water monitoring sphere.

In freshet period both the Ministry of ecology and the Committee for Water Management should make the complex hydrological-hydrochemical observation together with one program (which was developed and agreed) because at present their monitoring network and program of samples are different (Tables 1 and 2).

Table 1. Monitoring stations of Committee for Water Management of Ukraine on the Tysa River

№	*№ in the program of the Committee for Water Management*	*Station's name*	*Periodicity of samples*	*Samples, which are analysed*
1.	5.25.1	Tysa river, 927 km, V.Bichkiv village, w/collect	Quarterly	Gen.- san.an.*, spec/s**
2.	5.25.2	Tysa river, 885 km, Tiachiv city.	Quarterly	Gen.- san.an.*, spec/s**
3.	5.25.3	Tysa river, 807 km, Vilok village, the border with Hungarian	Quarterly	Radioactivity*** Gen.- san.an.*, spec/s**
4.	5.25.4	Tysa river, 696 km, Chop city, the border with Hungary	Quarterly	Radioactivity*** Gen.- san.an.*, spec/s**
5.	5.25.5	Tysa river, 714 km, canal Charonda, st. Esen, w/coll	Quarterly	Gen.- san.an.*, spec/s**
6.	5.25.6	Tysa river, 807 km, canal Batar, Vilok village, w/coll	Quarterly	Gen.- san.an.*, spec/s**
7.	5.25.7	Tysa river, 824 km, canal Klinovsky, st. Klinovo	Quarterly	Gen.- san.an.*, spec/s**
8.	5.26	Latoritsa river, right tributary of Tysa river, 65 km, Chop city, the border with Slovakia	Monthly	Radioactivity*** Gen.- san.an.*, spec/s**
9.	5.27	Uzh river, right tributary of Latoritsa river, 45 km, the border with Slovakia	Monthly	Radioactivity*** Gen.- san.an.*, spec/s**

Remarks: ** Gen.- san.an. – General sanitarian water samples analysis;*
*** - spec/s – specific water samples analysis;*
**** - ^{137}Cs and ^{90}Sr – Radioactivity water samples analysis. Itemize list of samples you can find in table 4.*

Table 2. Monitoring stations of the Ministry of ecology and natural resources of Ukraine on the Tysa River

№	*Station's name*	*Periodicity of samples (number/year)**	*Category of station*
1.	Tysa river – Tiachiv city, 2,9 km upward of city	4	III
2.	Tysa river – Tiachiv city, 1,1 km downward of city	4	III
3.	Tysa river – Vilok village, inside of village	6	IV
4.	Tysa river – Hust city, 4 km upward of city	4	IV
5.	Tysa river – Hust city, 1,3 km downward of city	4	IV
6.	Tysa river – Chop city, inside of city	6	IV
7.	Tysa river – Rahiv city, 0,5 km upward of city	4	IV
8.	Tysa river – Rahiv city, 0,5 km downward of city	4	IV
9.	Latoritsa river – Svaliava city, 1 km upward of city	4	IV
10.	Latoritsa river – Svaliava city, 1 km downward of city	4	IV
11.	Latoritsa river – Pidzollia village, 1 km upward of village	4	IV
12.	Latoritsa river – Mukachevo city, 1 km upward of city	12	III
13.	Latoritsa river – Mukachevo city, 1,5 km downward of city	12	III
14.	Latoritsa river – Chop city, 1 km downward of city	6	IV
15.	Uzh river – Pecherisi city, 0,5 km upward of city	6	III
16.	Uzh river – Pecherisi city, 0,5 km downward of city	6	III
17.	Uzh river - Uzhgorod city, 1 km upward of city	12	III
18.	Uzh river - Uzhgorod city, 2 km downward of city	12	III
19.	Chorna Tysa river – Iasinia village, 1 km upward of village	4	IV
20.	Chorna Tysa river – Iasinia village, inside of village	4	IV
21.	Bila Tysa river – Lugi village, 1 km downward of village	4	IV
22.	Shopurka river – Veliky Bichkiv, 1 km upward of village	4	IV
23.	Shopurka river – Veliky Bichkiv, inside of village	4	IV

Remark: ** As a rule, the schedule of sample is: over XII-III months – 2 times; IV-VI months – 1 times; VII-IX months – 1 times; rain freshet (about X month) – 1 times; XI-XII months – 1 times.*

Table 3. Programs and schedule of hydrochemical samples at the different categories stations (Peleshenko V. I., Hilchevskyi *V. K., 1997)*

Schedule of samples	*Stations of I category*	*Stations of II category*	*Stations of III category*	*Stations of IV category*
Daily	Visual observation, instrumental tests O_2, pH, W (1/R). Sample.	Visual observation	-	-
Quarterly	Program A*	-	-	-
Monthly	Program B**	Program A Program B	Program B	-
In basic hydrological phases	Program CP***	Program CP	Program CP	Program CP

*Remarks: * Program A – visual observation, evaluation of rate (altitude), water temperature (t^o), pH, conductivity (W), biochemical oxygen demand through five days (BOD5), chemical oxygen demand (COD), concentration of suspended solids (SS), dissolved oxygen ($O_{2\ diss.}$) and 2-3 basic contamination elements specific for this station.*

*** Program B – evaluation of rate (altitude), t^o, pH, $O_{2\ diss.}$, BOD5, COD and basic contamination elements specific for this station.*

**** Program CP – common (required) program is: visual observation, evaluation of rate (altitude), t^o, limpidity, colour, odor, pH, $O_{2\ diss.}$, BOD5, COD, SS, mineralization, biogenic elements, petroleum derivatives, synthetic surfactants species, phenol, pesticide, heavy metals.*

On the first category stations required samples (without analyses) for extreme case. Keeping time is 10 days.

The development and provision of scheme for urgent opening additional hydrochemical stations with full complex of hydrochemical samples on existent stations (Tables 1 and 2) is required for I-IV category stations (Table 3). The frequency of samples should be more often: daily (visual observation, instrumental tests), quarterly, monthly.

The above mentioned observations are made at the places of industrial, agricultural, domestic objects, near settlements, on the mountain parts of the rivers, on specific places, which are defined on the basis of information about particular parts of water object both in normal condition and in freshet period, when the intensive washout of contaminating agents (natural and anthropogenic genesis) from flooded area happens. Special control is to be done on natural and artificial closed water object, draw-wells, holes for all kinds of water-use.

The estimation of water quality requires the definition of hydrochemical elements, ratified by the Ministry (from 11-th September 1996 № 1100) for natural water and for all pollution springs. They include dissolved oxygen, pH, suspended solids, mineralization, sulphates, chlorides, ammonium nitrogen, nitrite, nitrate, phosphates, *petroleum derivatives*, biochemical oxygen demand and chemical oxygen demand.

Proceeding from stated above, we should find the most informative main and complex samples for estimation and control of river water quality in freshet period with consideration of the specificity of Carpathian rivers basin (industry, transport, domestic, rural and forestry objects in the basin of each river).

The monitoring actions on the flood dangerous water objects have to make hydrochemical observation in “relaxational” period (after freshet period, but before typical mean annual hydrochemical regime). This observations can be made for short programmes at the stationary stations, are obligatory in the mountain and flat parts of the rivers in the same time.

Table 4. List of chemical elements measured at Monitoring stations of Committee for Water Management of Ukraine

№	*Elements*	*Unit of measurement*
	a) General sanitarian water samples	
1.	Water temperature	degrees centigrade
2.	Limpidity	cm
3.	Odor	number
4.	Colour	degrees
5.	Suspended solids	mg/dm^3
6.	pH	non-dimensional
7.	Ammonium nitrogen	mg/dm^3
8.	Nitrite nitrogen	mg/dm^3
9.	Nitrate nitrogen	mg/dm^3
10.	Phosphate	mg/dm^3
11.	Chemical oxygen demand (COD)	mgO_2/dm^3
12.	Biochemical oxygen demand through five days (BOD5)	mgO_2/dm^3
13.	Dissolved oxygen	mg/dm^3
14.	Alkalinity	$mg\text{-}equivalent/dm^3$
15.	Acidity	$mg\text{-}equivalent/dm^3$
16.	Stiffness	$mg\text{-}equivalent/dm^3$
17.	Solid residual	mg/dm^3
18.	Sulfate	mg/dm^3
19.	Chloride	mg/dm^3
20.	Calcium	mg/dm^3
21.	Magnesium	mg/dm^3
22.	Iron	mg/dm^3
23.	Potassium	mg/dm^3
24.	Natrium	mg/dm^3
	b) Specific water samples	
25.	Phenol	mg/dm^3
26.	Petroleum derivatives	mg/dm^3
27.	Aminoproducts	mg/dm^3
28.	Nitroproducts	mg/dm^3
29.	Chrome trivalent	mg/dm^3
30.	Chrome sexivalent	mg/dm^3
31.	Copper	mg/dm^3
32.	Zinc	mg/dm^3
33.	Manganese	mg/dm^3
34.	Fluorine	mg/dm^3
35.	Cadmium	mg/dm^3
36.	Nickel	mg/dm^3
37.	Aluminium	mg/dm^3
38.	Lead	mg/dm^3
39.	Cobalt	mg/dm^3
40.	Mercury	mg/dm^3
41.	Pesticide	mg/dm^3
42.	Synthetic surfactants species	mg/dm^3
	c) Radionuclids	
43.	Caesium -137	$curie/dm^3$
44.	Strontium -90	$curie/dm^3$

Table 5. List of chemical elements measured by Monitoring stations of the Ministry of ecology and natural resources of Ukraine

№	*Elements, Unit of measurement*	*Remark of the Ministry*
1	*2*	*3*
1.	Odor, number	The first day analysis
2.	Limpidity, cm	
3.	Colour by Pt-C_o scale, degrees	
4.	Temperature, degrees centigrad	
5.	pH	
6.	Oxygen, mg/dm^3	
7.	Oxygen saturation coefficient, %	
8.	BOD5, mgO_2/dm^3	
9.	Carbon dioxide, mg/dm^3	Standard analysis
10.	Magnesium, mg/dm^3	
11.	Chloride, mg/dm^3	
12.	Sulfate, mg/dm^3	
13.	Mineralization, mg/dm^3	
14.	Stiffness, mg-equivalent/dm^3	
15.	Hydrocarbonate, mg/dm^3	
16.	Natrium, mg/dm^3	
17.	Calcium, mg/dm^3	
18.	Phosphate, mg/dm^3	
19.	Silicate, mg/dm^3	
20.	Phosphorus, mg/dm^3	
21.	Suspended solids, mg/dm^3	Biogenetic agents
22.	Ammonium nitrogen, mg/dm^3	
23.	Nitrite nitrogen, mg/dm^3	
24.	Nitrate nitrogen, mg/dm^3	
25.	Sum of mineral nitrogen combination, mg/dm^3	
26.	Bichromate oxidative, mgO_2/dm^3	Contaminating agents
27.	Permanganate oxidative, mgO_2/dm^3	
28.	Chrome 6+, mkg/dm^3	
29.	Phenol, mg/dm^3	
30.	Petroleum derivatives, mg/dm^3	
31.	Synthetic surfactants species, mg/dm^3	
32.	Iron, mg/dm^3	Metals
33.	Copper, mkg/dm^3	
34.	Zinc, mkg/dm^3	

The estimation of water chemical composition transformation degree during the change of water from fluvial to subsoil and subsurface, has an important health and water use sense, as well as their influence no the quality of potable water taken from draw-wells.

The realization of complex of mentioned measures would allow making the efficient control on the situation of river water quality in freshet period on the Tysa River.