State of Belarus Transboundary Rivers and Problems

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The territory of Belarus is a watershed for the Baltic and Black Sea Basins. Approximately 55 % of river runoff is accounted for the Black Sea basin and 45% of river runoff is accounted for the Baltic Sea basin. All the large five rivers in the republic are transboundary. Water quality in these rivers is discussed below.

Niemen River Basin

The monitoring observations over the state of ecosystems in the Niemen river basin through hydrochemical parameters are conducted in 62 surface water monitoring points included in the state register of observation points, 5 of which are located in transboundary reaches of such rivers as Niemen, Viliya, Krynka, Svislotch, and Tchornaya Ghancha. In total, 22 water courses and 12 water bodies were covered by stationary observations.

Annually, about 500 surface water samples are taken and identification of more than 18 000 hydrochemical characteristics is made in the Niemen river basin.

Hydrobiological observations along the Niemen river and its tributaries are held almost in the same river stations as hydrochemical observations.

Recently, indicators of water quality in Niemen at Privalka (water flowing to Lithuania) have met the requirements of water bodies used for fishery.

If we use hydro-chemical and –biological indicators altogether, water in the Niemen river and its tributaries is classified as clean.

Only near the city of Grodno, the river water is considered as moderately polluted water due to disposal of industrial and domestic wastewater into the river system.

There are regular observations over lake ecosystems: Bolshiye Shakshty, Batorino, Vishnevskoye, Myastro, Narotch, Swir, Svityaz and Vileiskoye reservoi. Within the framework of implementation of measures under the State Program for National Environmental Monitoring System (NEMS) Development in the Republic of Belarus, Beloye lake and Volpyanskoye, Zelvenskoye and Minitchi lakes were also included in the monitoring observations.

Most water bodies of the Niemen river basin are located within the catchment area of Viliya river. Conditions of aquatic ecosystems within the Narotch group of Narotch, Myastro and Batorino connected with each other through short creeks have been steady good over a series of years. In long-term observations, percentage of most priority substances in lake water was well below the maximally permissible level. The main water polluters in the basin are such enterprises as Grodnovodokanal, Grodnoazot and Vodokanal in Baranovitchi.

The Niemen river basin is characterized by the following water-ecological parameters:

- unsatisfactory quality of river water used for drinking and household purposes;
- absence of treatment plants in some cities and most rural settlements;
- clogging and siltation of fish ponds;
- lack of accounting meters in fish farms;
- prevalent impact of non-point pollution sources (from 40 to 90 %) on water quality in the river and its tributaries;
- transfer of considerable quantity of Viliya water to the Dnieper basin through Vileysko-Minsk water system;
- irregularity of removal and treatment of wastes from livestock farms;
- a need for protection of unique water objects (Narotch lake group);

- transboundary transfer of pollutants along the river channel to Lithuania.

Western Bug River Basin

The monitoring observations over the surface water quality in the Western Bug river basin are conducted in 18 monitoring points included in the state register of observation points, 11 of which are located in transboundary reaches of such rivers as Western Bug, Mukhavetz, Narev, Lesnaya, Lesnaya Pravaya and Kopayuvka. In total, 7 water courses are covered by stationary observations.

Annually more than 200 river water samples are taken and identification of nearly 7 000 hydrochemical characteristics is made by organizations and territorial branches of the Ministry of Environment.

Hydrobiological observations are conducted in transboundary stations of the Western Bug river and its tributaries.

Regular observations cover a reach of Western Bug from Tomashevka to Novoselki (transboundary observation points on the boundary with Poland) and largest tributaries.

As compared to other large rivers in the republic, waters in Western Bug are pretty much saline. From stationary observations, water flown from Poland has higher percentage of dissolved salt. Another characteristic of this watercourse is a wide range of suspended matter concentrations: recent years, their minimum (3.6-10.2 mg/dm^3) was fixed along the whole river in March, while maximum (31.9 mg/dm^3) was in September (within the precincts of Brest).

In annual dimension, a large amount of organic matter is fixed along the whole length of Western Bug; the dichromate oxidizability at 45 - 49 mgO_2/dm^3 characterizes half of samples taken near Retchiza settlement (after inflow of the Mukhavetz river). This reach is considered as a "very problematic" one in terms of biogenic elements. Here, the concentration of ammonia nitrogen is 1.4 MPC, nitrite nitrogen is 1.7 MPC, and phosphates amount to 3.2 MPC.

The analysis of long-term dynamics of ammonia nitrogen concentration indicates that water pollution in Western Bug by this biogenic matter takes place directly within the territory of the republic. Increased concentrations of N-NH_4 (1.1-2.0 MPC) are fixed in 67 % of water samples taken in the reach Retchiza-Novoselki in the course of a year.

Since 2008, Lukovskoye and Bialowieza forest reservoirs, as well as Rudavka (near Rudnya) and Spanovka (upstream of Medno) waterways have been included in the monitoring system of Western Bug basin.

The state of aquatic ecosystems of Western Bug's tributaries remains stable, while their waters are classified as clean – moderately polluted. This indicates to relatively favorable environmental situation in the waterways.

Larger impact of point pollution sources on river water quality is observed in the Mukhavetz river and the Western Bug river, where the city of Brest discharges its wastewater.

Water-environmental situation in the Western Bug basin is characterized by the following:

- transboundary transfer of pollutants along the river channel that influx to boundary station between Ukraine (upstream), Belarus (right bank) and Poland (left bank); then transfer increases through influx of pollutants at the boundary station between Belarus and Poland from transitive collecting areas in these countries;

- prevalent impact of non-point pollution sources (from 60 to 90 %) on water quality in the river and its tributaries;

- pollution of Western Bug and Mukhavetz rivers through waterage of goods (Dnieprovsk-Bug canal is a part of large transboundary water transport system Ukraine-Belarus-Poland).

Dnieper river basin

Monitoring observations over surface water quality in the Dnieper basin are conducted in 24 water bodies (19 rivers, 4 reservoirs and 1 lake), including 6 transboundary reaches of Dnieper, Sozha, Vikhry, Iputy and Besedi rivers – on waters flowing from the Russian Federation. The monitoring network comprises 71 observation points (stations).

In order to assess the state of water bodies within the Dnieper basin and estimate levels of their pollution, 728 surface water samples are taken and more than 28 000 hydrochemical characteristics were identified. The analysis of results indicates to generally improved state of water bodies in the basin: the total quantity of fixed MPC exceed decreases (14.5 % of the total amount of hydrochemical characteristics).

Major contribution to the total quantity of cases of exceeding the maximum permissible concentration is made by iron – 16.3 %; copper compounds – 15.4 %; manganese – 13.6 %; and, zinc – 10.9 %. While lesser contribution is made by ammonia nitrogen – 9.6 %; inorganic phosphorus – 8.3 %; nitrite nitrogen – 5.6 %; and, easy oxidizable organic matters – 4.2 %.

Stationary observation points along the Dnieper river are located in the reach from Sarviry settlement (transboundary station on the border with Russia) to Loyev urban village (transboundary station on the border with Ukraine). Developed industrial settlements such as Orsha, Shklov, Mogilyev, Bykhov, Retchiza, and Loyev are located along the river. Industrial wastewater and surface run-off from this territory, along with agricultural entities located in the river catchment form the main polluting sources for the river and its tributaries.

Hydrobiological observations over the Dnieper river are conducted in the river reach from Sarviry to Loyev and in river tributaries.

In terms of hydrobiological indicators, aquatic ecosystems of the Dnieper river in area of Sarviry, Orsh, and Mogilyov refer to classes II – III (clear – moderately polluted). The environmental state of the river in stations of Shklov, Bykhov and Loyev urban settlements is estimated by class III (moderately polluted).

Pripyat River Basin

Monitoring observations over surface water quality in the Pripyat river basin are conducted in 26 water bodies, including 19 waterways and 7 lakes. The network of regular observations comprises 38 observation points (stations), of which 9 are located in transboundary reaches of the waterways. Within the Pripyat river basin, the quality of surface water flowing from and into Ukraine is monitored.

For assessment of basin's surface water quality, more than 300 water samples are taken, with identification of more than 11 000 of hydrochemical characteristics. The general number of cases when MPC is exceeded is 13.3 % of the total hydochemical characteristics.

Major contribution to the total quantity of cases of exceeding the maximum permissible concentration is made by iron – 21.2 %; manganese compounds – 15.7 %; copper – 13.3 %; and, ammonia nitrogen – 12.7 %. While lesser contribution is made by zinc– 7.2 %; inorganic phosphorus – 7.0 %; total phosphorus – 5.8 %; easy oxidizable organic matters – 4.5 %; and, nitrite nitrogen – 3.7 %.

The main pollution sources for the river and its tributaries are the cities of Pinsk, Mozyr and Narovl located along the river, as well as agricultural entities in the catchment.

The unique character of the Pripyat river's transboundary water resources in that the river crosses the state boundaries of two riparian states – Ukraine and Belarus – two times in the upper and the lower reaches. This circumstance places the two countries almost in equal conditions in terms of water use and pollution, on the one hand, and makes the development of joint basin management system more difficult, on the other hand.

There is a problem related to the use of a feeding system of Dniepr-Bug canal. This is one of the most complicated issues of water management in the basin. Here, 3 major aspects can be underlined:

Legal, which relates to the status of water intake and the most part of feeding system, the conditions of receiving reliable information on quantities of diverted water, and the development of new operation rules for intake of the Dniepr-Bug canal and Byelozersk feeding system,

Environmental, which concerns the deterioration of general environmental situation and degradation of the Pripyat river channel downstream of intake and the environmental state of Svyatoe, Volyanskoye and Beloye lakes,

Economic, which concerns the existing infrastructure of the feeding system of Dniepr-Bug canal as a whole. A share of flood flow passes through this system that reduces area and height of flooding and water-logging of the surrounding territories.

Conclusions. The degree of the use of river runoff in Belarus is not more than 10% of the river runoff formed within the boundaries of the republic in the year of 95% flow probability.

All large cities in the republic are provided with treatment plants. Quantity of wastewater discharged into surface water sources has been decreasing steadily since 1995. However, there is a great need for reconstruction of the treatment plants and intensification of treatment, first of all, from biogenic elements in the discharged wastewater.

In 2010, “The National Strategy for Water Resources Use” was developed in the republic. This would allow improving considerably water quality in transboundary waterways.