

Water-ecological problems of rivers of Western Polissia of Ukraine (on an instance of water-collecting area Horyn)

Yatsyk A.¹, Pasheniuk I.², Gopchak I.³, Basiuk T.⁴

^{1, 2}Ukrainian research institute of water-ecological problems, Inzhenernyi lane, 4-B, Kyiv, 01010, Ukraine,

³National university of water economy and natural management, Soborna Str., 11, Rivne, 33028, Ukraine,

⁴S. Demianchuk International economic-humanitarian university, Academician S. Demianchuk Str., 4, Rivne, 33000, Ukraine; e-mail: ^{1, 2}undiwep@gmail.com, ³gopchak_igor@ukr.net, ⁴tanya_basyuk@ukr.net

The purpose. To determine basic water-environmental problems of rivers of Western Polissia of Ukraine (on an instance of water-collecting area Horyn). **Methods.** Dialectic method of scientific knowledge, analysis and synthesis, system generalization. **Results.** State-of-the-art ecological state of basin of the river Horyn is characterized. Basic water-environmental problems in water-collecting area are analyzed, in particular water deliveries of the population and branches of national economy, complex geological structure of water-collecting area, provision of water service of Khmelnytskyi atomic power plant, reclamative land development, water pollution, etc. It is established that for today water-ecological situation in basin of river Horyn is catastrophic, that influences all the sides of vital activity of the person and leads to significant ecological and economic losses. Owing to breaking the water balance river Horyn shallows. The major factors influencing deterioration of surface and subsoil waters in water-collecting area, are disposals of sewage. Except for pollution of water objects, the urgent problem demanding the solution is the acting structure of lands in the basin of river Horyn. As a result of excessive agricultural land use the areas of natural lands were sharply divided out. **Conclusions.** By results of the analysis of water-environmental problems in the basin of river Horyn it is established that a priority task for solving crisis situation is execution of complex assessment on transformation of ecosystem of the river with the subsequent development of nature protection measures. The solution of the given problems depends first of all on perfecting rational water management in water-collecting area on the basis of implementation of basin principle of water resources management.

Key words: river, surface waters, underground waters, water-collecting area, water service, quality of water.

<https://doi.org/10.31073/agrovisnyk201810-09>

Introduction (problem). Water resources are one of the most important natural resources that provides conditions for the sustainable development of any territory. The need for water resources of the rivers is constantly increasing, which, accordingly, affects the quantitative and qualitative indicators of their status, because the rivers are both water sources and sewage receivers. Due to the economic use of the pool of any river undergoes a number of certain anthropogenic loads. The river basin itself is an indicator of the state of the environment, which is determined by the combined effect of natural spatial and temporal climatic, hydrological, soil-vegetation, geological and geomorphological and other factors.

The urgency of the topic is determined by the complex socio-ecological situation in the basins of the Western Polissya rivers. After all, aquatic ecosystems for many decades were considered and used only as an economic resource for industrial and agricultural production, as well as for discharging of their pollutants. This led to a rapid reduction of the ecological potential of natural waters [1, 2].

Analysis of recent research and publications on the topic under study. The assessment of water quality from different positions is devoted to a number of scientific studies. Significant contribution to the methodology of integrated assessment of the ecological status of river basins was made by J. Gryb, V. Sondak [3], O. Klymenko, I. Statnyk [4], A. Yatsyk [1, 2, 5]. Some issues of assessment of the hydroecological state of the Gorin river basin were considered in the works of M. Romas, V. Khilchevsky, V. Grebin, O. Chunarev V. Melnik and others [6].

The purpose of the research – identify the main water management and environmental problems of the Western Polissya rivers of Ukraine (for example, the Gorin river basin).

Research methods. The dialectical method of scientific knowledge, analysis and synthesis, systemic generalization was applied.

Research results. The Gorin River belongs to the Pripjat River basin and is a transboundary river flowing

through the territory of Ukraine and Belarus. The upper part of the river basin is located in the northern part of the Podillya upland and the eastern part of the Volyn upland. The middle and lower parts of the river lie within the limits of the Polissya lowlands within the limits of the Volyn and the Lesser Polesie [7, 8].

System analysis anthropogenic pressure, study materials and design of individual publications on water management situation in the basin. Horyn showed a significant ecological imbalance of the ecosystem [3, 4, 6, 8]. It was established that today Water Management and environmental situation in the basin Goryn is catastrophic, which in turn led to a series of Water Management and Environmental problems significantly evident in recent years.

The problem of water supply to population and economic sectors is quite relevant. The main source of drinking water is groundwater is used centrally in cities and towns via water intake group and individual wells and in rural areas - mine pit. The biggest water users in the basin Goryn is town Rivne. A relatively powerful water users groundwater is Slavuta, Netishyn, Zdolbuniv, Shepetivka, Kvasyliv. For centralized water supply intakes are primarily used with approved reserves of groundwater (Rivne, South Rivne, Novomylyskyy, Babynski and Goshchansky) [9].

The annual increase in population and the development of infrastructure town Rivne led to a significant strain on existing water intake system groundwater. Therefore, to cover the deficit in water supply needs of the city was additionally commissioned Goshchansky intake of horbashivskoho horizon. In the initial period of the intake (1979-1982) Its impact on groundwater tiered regime was marked not. However, from 1987, when the daily water supply project reached the mark (55 m³/day) was found change in the mode of groundwater, leading to a sharp decline in groundwater level. As a result, residents in 45 settlements Goshcha area there is a problem of lack of water in the wells. Effect concentrated on the selection of groundwater regime groundwater level spread to an area with a radius of about 10 km. groundwater level maximum reduction was observed in the vicinity of villages Mnyshyn, Voskodavy, Gorbiv and Podolyany. Here in the valley river Goryn, depression hole formed in the area of 200 km². [9].

The ground grid formed deep cracks and irregularities. Faults in the ground water intake area (village Chudnytsya, Voskodavy, Mnyshyn, Gorbakiv) are 5-7 meters deep and 1,5 meters wide. Cracks in the ground in recent years appeared farther than 15 kilometers from the intake area. In addition, shallow or completely missing small rivers and lakes. Because water balance disorders river Goryn grows shallow and in its bed there many sand spits and shoals.

This situation is the result not performed at the time of hydrogeological research. In addition, the intake is built with flagrant violation layout wells, which was recommended in the calculated reserves of groundwater.

The problem of complex geological structure of the basin. The presence of powerful layers of chalk and marl in the basin Goryn due to the prospect of karst. In these areas of possible failures of the earth's surface. Main karst massifs located in the basin west of the city Slavuta, near the village Radushivka, Storonychi in the upper river Gnylyi Rig. Intensive selection process contributes to groundwater leaching of chalk and can lead to unforeseen consequences, if it considers that in this part of the basin is Khmelnytsky NPP.

The problem of water supply Khmelnytsky occupies a special place among water management and environmental problems in the basin Goryn.

The main vodospozhyvchamy within the NPP is cooling units. Source conduit technical - r. Goryn. For the purposes of drinking water within the NPP and the city Netishyn use of underground water horizons.

Sewage and treatment of domestic and industrial waste water is centralized city. After full cleaning, decontamination and purification of biological ponds wastewater discharged into the cooling pond of NPP for reuse.

In the city Netishyn equipped with rainwater drainage with the release of storm water without treatment in the bypass channel. At present, the phenomenon of "blooming" of water in the channel it as muddy and tap facility does not meet its purpose. At overflow channel automatically water poured in through the top Goryn retaining structures, causing contamination of surface waters of the river.

For a complete description of the current state of water resources within the Khmelnytsky NPP held generalization and systematization of data of the state statistical ZTP (water management) in recent years. The analysis showed that the average in recent years from surface sources, which is mainly from the bed was Goryn was 28.28 million m³ of water taken, including irrevocably nearly 25 million. m³. Moreover, according to the

operational service water selection is usually carried out during flooding or flooding, which adversely affects the ecological status of river ecosystems [10].

First, the river irrevocably lost a significant amount of runoff, and secondly, the removal of flood peaks negative impact on the water regime of river and riverbed processes that generally affects the functioning of the river ecosystem. Increasing the water content Goryn by runoff Dniester (2 billion. m³ per year), as stipulated in the approval of the introduction of the Khmelnitsky nuclear power plant, has no sense, because she was. Dniester currently requires a "recovery." In addition, despite the existing wastewater drainage system at the Khmelnitsky nuclear power plant, in line r.Gnylyi Rog discharged contaminated water include those organic substances present easily oxidized [6]. All this shows that the solution to the problem of water supply Khmelnitsky NPP, as well as compliance with conditions of safe operation should be immediate.

The problem of reclamation land development. Most active in the basin reclamation systems belong to unilateral actions that are designed to discharge water from their territories. The current technical condition of most drainage systems so that they can not perform their functions, and their destruction creates environmental and man-made hazards. Due to silting of canals, reservoirs and overgrowth of bushes growing area and duration of flooding farmland and even settlements. Almost 30% of reclaimed land West Polesie used as unproductive meadows and pastures, while some of them there is a secondary waterlogging.

The problem of water pollution. The main factors of the deterioration of surface and ground water quality in the river basin are wastewater discharges. The greatest danger to surface water is the inflow of organic, biogenic, toxic synthetic active substances, petroleum products, and heavy metals into the river. The quality of underground water used for centralized water supply is in compliance with the State Water Pollution Convention. As for the groundwater in the wells, then, by comparing the results of research and background indicators, their chemical composition has undergone some changes in the direction of deterioration. There was an increase in the content of sulfates, chlorides, mineralization of water, iron content. This led to the fact that the groundwater in most wells did not meet the standards [10].

In addition to the constant tendency of water pollution in the basin Goryn urgent problem that needs solving priority is operating structure of land. As a result of excessive agricultural land development izko plunged into account features natural areas of natural land. In the transformed landscapes occurring negative processes. Dynamics of increase in the area of degraded land indicates the presence of adverse trends in the evolution of soil. Construction of industrial facilities and drainage systems destroyed primary hydrographic network changed the natural processes of the flow of rivers and its quality condition.

Conclusions

This complex of water management and ecological problems creates a tense ecological situation in the Goryn river basin, which affects all aspects of human life and leads to significant environmental and economic losses. Therefore, in order to determine the ways to exit from the existing crisis situation in the region, it is urgent to carry out a comprehensive assessment of the transformation of the Gorin river ecosystem with the further development of priority measures to restore the natural balance of the basin. The solution of these problems depends, first of all, on the improvement of rational ecologically safe water use in the river basin based on the implementation of the basin principle of water resources management, which will be directed at the sustainable water supply of the population and sectors of the national economy and prevention of harmful effects of water.

Bibliography

1. Yatsyk A.V. (2001). Ekolohichna bezpeka v Ukraini. [Environmental safety in Ukraine]. Kyiv: Heneza. P. 85 – 92. [In Ukrainian].
2. Yatsyk A.V. (1997). Ehkologicheskie osnovy ratsional'nogo vodopol'zovaniya. [Ecological bases of rational water use]. Kiev: Geneza. P. 162 – 178. [in Russian].
3. Hryb Y.V., Klymenko M.O., Sondak V.V. (1999). Vidnovna hidroekolohiia porushenykh richkovykh ta ozernykh system (hidrokimiia, hidrolohiia, upravlinnia): navchalnyi posibnyk T. 1. [Restoration Hydroecology broken river and lake systems (hydrochemistry, hydrology, management): training manual vol. 1]. Rivne: Rivnenenskyi derzhavnyi tekhnichnyi universytet. P. 36 – 64. [In Ukrainian].

4. *Klymenko O.M., Statnyk I.I.* (2012). Metodolohiia pokrashchennia ekolohichnoho stanu richok Zakhidnoho Polissia (na prykladi r. Horyn): monohrafiia. [Methodology for improving the ecological state of the Western Polesi rivers (for example, the Goryn River): monograph]. Rivne: NUVHP, P. 78–104. [In Ukrainian].
5. *Romanenko V.D., Zhukynskyi V.M., Oksiuk O.P. et al.* (2001). Metodyka vstanovlennia i vykorystannia ekolohichnykh normatyviv yakosti poverkhnevyykh vod sushi ta estuariiv Ukrainy. [Methodology for the establishment and use of environmental quality standards for surface waters and estuaries]. Kyiv: ZAT «VIPOL». 48 p. [In Ukrainian].
6. *Khilchevskyi V.K., Romas M.I., Chunarov O.V. et al.* (2011). Hidroekolohichnyi stan baseinu Horyni v raioni Khmelnytskoi AES. [Hydroecological state of the Goryn basin in the Khmelnytsky NPP]. Kyiv: Nika-Tsentr. P. 76 – 83. [In Ukrainian].
7. *Yatsyk A.V., Byshovets L.B., Bohatov Ye.O. et al.* (Yatsyk A.V. Ed.). (1991). Mali richky Ukrainy: dovidnyk. [Small Rivers of Ukraine: Directory]. Kyiv: Urozhai. P. 159 – 166. [In Ukrainian].
8. *Molchak Ya.O., Mihas R.V.* (1999). Richky Volyni. [Volyn rivers]. Lutsk: Nadstyria. P. 56 – 78. [In Ukrainian].
9. *Byshovets L.B., Byshovets I.M. et al.* (Yatsyk A.V. head). (2004). Otsinka suchasnoho rivnia antropohennoi transformatsii ekosystemy r. Horyn i rozrobka zakhodiv po vidnovlenniu pryrodnoi rivnovahy baseinu: zvit pro NDR UNDIVEP. [Assessment of the modern level of anthropogenic transformation of the Gorin River ecosystem and the development of measures to restore the natural balance of the basin: a report on the research work of the UNIVIL]. Kyiv. P. 83 – 91. [In Ukrainian].
10. Rozrobka skhemy optymizatsii systemy vodopostachannia ta vodovidvedennia m. Rivne: naukovo-tekhnichnyi zvit. [Development of the scheme of optimization of the water supply and drainage system in Rivne: scientific and technical report]. Kyiv. 2011. P. 26 – 35. [In Ukrainian].