

ORGANIZATIONAL AND METHODOLOGICAL PROBLEMS OF THE RATIONAL USE AND PROTECTION OF THE KUYALNYTSKYI ESTUARY LANDS

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Abstract

The condition of the Kuyalnytskyi estuary is one of the most acute environmental problems of the Northern Black Sea coast. Scientists are discussing various measures to restore this mega ecosystem, some of which are included in regulatory state and regional documents. However, unfortunately, these measures were only partially implemented and did not solve the problem at all, and sometimes even led to dangerous local consequences. The main purpose of the study is to draw attention to the problems of estuaries of Odesa region and to develop recommendations for identifying solutions to protect environmental safety and conservation of estuaries of the Black Sea. The main objectives of the study are to generalize the current state of the Kuyalnytskyi estuary basin, consideration and assessment of environmental, social and man-made factors, determining the list of possible hazardous impacts on the environment. It is established that the aquatic and terrestrial ecosystems of the Kuyalnytskyi estuary are in a state of crisis due to climate change and the disproportional significant impact of anthropogenic pressure on the waters and the catchment area of the estuary (~ 2240 km²). The Kuyalnytskyi estuary is rapidly losing its ability to restore its natural resource potential. The analysis of the ecological condition of the Kuyalnytskyi estuary shows that the main reasons that hinder the rational use and protection of estuary lands are the lack of scientifically sound, clearly defined development strategy; imperfection of legislative and regulatory support; imperfection of legal, organizational, economic bases for the formation of full-fledged development of the resort and recreational zone of Kuyalnyk.

Keywords: Kuyalnytskyi estuary, ecosystem, natural resources, land protection, conservation problems, ecological condition.

INTRODUCTION

Kuyalnytskyi estuary is an important recreational and balneological object of national and world importance. It is included in the list of 14 most valuable estuarine complexes of the Black Sea region of Ukraine. It contains a deposit of therapeutic mud and mineral waters. However, today the ecological state of the Kuyalnytskyi estuary can be described as a critical, due to the catastrophic shallowing of the reservoir, reducing water levels and depths, as well as the associated increase in brine salinity, which threatens the complete disappearance of the estuary and loss of unique therapeutic mud and brine, including the peculiar flora and fauna of the reservoir. Therefore, the preservation of natural complexes and objects in the basin of the Kuyalnytskyi estuary, which have a special health, historical, cultural and scientific value, is not only an ecological but also a socio-economic national task. Theoretical and practical significance, the objective need to solve these issues have determined the relevance of the topic of this study.

MATERIALS AND METHODS

The methodological basis of the work is the work of scientists in the field of research of ecosystems of the Northern Black Sea coast, in particular, the ecological state of the Kuyalnytskyi estuary basin. In addition, the work is based on the results of monitoring observations of the Department of Ecology and Natural Resources of Odesa Regional State Administration on the state of the environment of the Odesa region. In the process of research to achieve this goal, the following methods of scientific knowledge were used: induction and deduction; economic-statistical and graph analytical methods; logical generalization, synthesis, comparison, system and spatial analysis.

RESEARCH RESULTS

The Kuyalnytskyi estuary is an estuary on the northwestern coast of the Black Sea, one of a group of Odesa estuaries located north of Odesa. Its feature is the process of formation of mineral waters, which are characterized by miraculous healing properties of brine, sulfide-silt mud. The climate on the site is hot, arid with warm winters. The main element of the relief is the Black Sea lowland, which gradually decreases towards the Black Sea. The surface of the lowland is plain flat. The shores of the Kuyalnytskyi estuary and the rivers of its basin are cut by beams and ravines, the watersheds are flat. The soil cover of the Kuyalnytskyi estuary basin has its specific features, connected, on the one hand, with the considerable meridional length of the estuary and the rivers Velykyi and Malyi Kuyalnyk, on the other - with its geographical position in the middle steppe to the southern (dry). This causes a fairly significant contrast in the structure of the soil cover of the territory, within which the dominant background soils are southern chernozems, southern chernozems residual and slightly saline. Natural flora is the most important source of bioresources of the Kuyalnytskyi estuary, which performs recreational, climate-forming and sanitary-hygienic functions. According to the scheme of geobotanical zoning of Ukraine, the territory of the Kuyalnytskyi estuary basin is in the zone of transition from fescue-feathergrass to bonfire-wormwood steppes of the Azov-Black Sea subprovince of the Black Sea (Pontic) steppe province of the Eurasian steppe zone (*Burkinsky, et al., 2019*).

Researchers show that the coastal zone of estuarine complexes of the north-western Black Sea coast, due to its advantageous (unique) position, is subject to significant anthropogenic pressure. These include agricultural use, due to both favorable climate conditions and the availability of fresh water, and territorial - proximity to major settlements: Odesa, Belgorod-Dnistrovskyi, Izmail and others. However, in the current situation, this use is more extensive than intensive. This leads to a conflict between human activities, primitive nature and environmental measures aimed at maintaining a sustainable (stable) environmental situation.

The constant influence of many wellsprings located within the I and II sanitary protection zones of water bodies leads to anthropogenic pressure on the Kuyalnytskyi estuary:

- 7 villages on the right and 5 villages on the left bank of the estuary, on which territory (approximately 10 km² and 8.8 km²) is inhabited and engaged in economic activities by 590 and 7800 people (according to the 2001 census), respectively;

- Kuyalnyk resort in the southern part of the estuary, where in the summer more than 6,000 patients are treated annually (about 0.5 km²);

- agricultural lands (arable land and pastures in the plains and watershed slopes), numerous unauthorized landfills, quarries for the extraction of stone and sand, 6 cemeteries;

- thermal power plant (CHP-1), oil transshipment enterprises, Odesa oil refinery, cement plant, railway lines leading to the railway stations Odesa-Sorting and Odesa-East, Bypass road M -14, gas stations and parking lots, as well as special purpose facilities (*Stepanenko, 2013*).

The most tense ecological situation has developed in the southern part of the water area and the coast of Kuyalnytsky estuary, where the world-famous balneological resort Kuyalnyk is located: recreational load

at certain times of the year (May-August) here is close to critical. In addition, the main one is the trampling of the coastal zone not only by pedestrians, but also by cyclists, motorcyclists and motorists, who are destroying the ground cover.

Another environmental problem of the Kuyalnytskyi estuary is the shallowing of the reservoir. The water content of the Kuyalnytskyi estuary and its salt regime depend on the ratio of the amount of precipitation that fell on the estuary water mirror and the volume of evaporation from it and regulation of river water flow in the estuary catchment basin. Global climate change has led to the estuary's water gradually evaporating, and replenishment occurs only through precipitation, which cannot even compensate for water evaporation. Numerous ponds and dams built along the Velykyi Kuyalnyk River and in the valley of rivers, streams and gullies, which impede the access of water in the estuary, played a negative role. According to Odesa State Ecological University data, obtained in 2010, it was established that in the basin of the Velykyi Kuyalnyk River there are about 135 artificial reservoirs (ponds, reservoirs) and quarries, dug. The total volume of all artificial reservoirs and quarries, ditches in the basin of the river Velykyi Kuyalnyk reaches 15.6 million m³.

The extremely unfavorable ecological situation in the Kuyalnytskyi estuary basin is largely due to unauthorized sand mining, which led to the formation of individual lakes and actions that led to the separation of the tributary that filled the estuary with fresh water. It should be noted that the extraction of curative industrial mud by the method of depletion of the bottom of the estuary to a depth of one and a half meters. As a result, salt began to fall in the reservoir, and the water level of the estuary reached a critical level, Kuyalnyk will not be filled naturally. In 2014, a system of pipelines was launched connecting the estuary with the sea. But this gave only a temporary effect, because the estuary can be filled with sea water only in the cold season (*Annan, et al., 2015*).

The hydroecological problems of the Kuyalnytskyi estuary, which is currently a virtually drainless lake, are primarily related to the preservation of the softness of its unique recreational resources (healing brine and curative sulfide-silt mud) and the conditions of their reproduction. The critical ecological state of the Kuyalnyk ecosystem is also evidenced by the high level of pollution of its main components: brine, peloids, aquatic organisms, soil and vegetation of the coastal zone, phenols, petroleum products, sulfates, ammonium nitrogen, vanadium, cadmium, lead) and in watercourses (for sulfate, petroleum products, vanadium). In the bottom sediments and soils of the adjacent zone of the Kuyalnytskyi estuary, in the dominant plants there was an excess of cadmium, lead, zinc, copper, vanadium relative to their clarks in the lithosphere, soil, land vegetation, respectively. The soils of the coastal zone of the Kuyalnytskyi estuary have a weakly alkaline reaction. The pH values range from 7.1 to 8.1%, the humidity of the surface layer (0-30 cm) varies in the range of 2-20%, the chloride content varies from 0.6 to 3.5 g / kg, the most saline part of the coastal strip is soil of the northern edge of the estuary (*Loboda, et al., 2016*).

The bulk of the pollution enters the Kuyalnytskyi estuary with runoff from the Velykyi Kuyalnyk River, and with direct runoff from the surrounding fields. For several decades, public authorities have not been able to build sewage treatment plants around the Kuyalnytskyi estuary. Although, it is the deterioration of the ecological balance of this reservoir with valuable medical resources that leads to the pollution of the Velykyi Kuyalnyk River by untreated sewage. Sewage discharge into the Velykyi Kuyalnyk River is carried out by the housing and communal services of the village of Ivanivka, in Kuyalnytskyi estuary - "Kuyalnyk Clinical Sanatorium".

Economic activities in watersheds, coastal slopes and estuary banks have led to the degradation of small rivers flowing into estuaries. Agricultural land use in coastal and sloping areas is most often in violation of the 100-meter water protection zone. Allocation of thousands of garden plots on the banks of estuaries has led to additional land ruin along the banks of estuaries and intensification of erosion processes, the appearance of numerous garbage dumps, fires in the dry season, burning vegetation on the slopes (*Gogolev, et al., 1988*).

The main source of oil pollution of reservoirs is the washing and steaming station of the Odesa railway, which operated for 60 years and was closed in January 2000. In the storage ponds are flushing oil waste, most of which are represented by bottom sediments containing petroleum products 43.0 - 83.3%. In the water of the ponds located on the territory of the washing and steaming station, the content of oil products is 8.48 - 11.76 mg / l, and in the "remote" lakes - 0.90 mg / l. Due to the high content of petroleum products in the soil of the sanitary protection zone of the estuary and in the water of the ponds, the study area is classified as an "ecological disaster zone". Currently, work is underway to extract oil-contaminated bottom sediments from ponds, remove contaminated soils and reclamation of the washing and steaming station (*Adabovsky, et al., 2012*).

Abrasion and landslides give abrasion-landslide processes on the coastal-sloping sections of the Kuyalnytskyi estuary, which are located in the western, south-western, south-eastern and eastern parts. The lands of the Kuyalnytskyi estuary are characterized by surface planarian water erosion. In 2010, on the coastal slopes near the sanatorium Kuyalnyk, the old landslide slope was intensified due to natural and man-made factors: intensive infiltration of surface waters as a result of melting abundant snow cover and prolonged rains, waterlogging of soils that make discharge of domestic waters from the plateau near the village of Kotovka.

It should be noted that significant environmental damage to the Kuyalnyk estuary was caused by the construction of three main gas pipelines with a diameter of 0.7-0.8 m on the active erosion-landslide slope of the Malyi Kuyalnyk River. During the survey of deformation changes in the protection zone of gas pipelines it is not recognized except for insignificant surface erosion of hardness of limestone and deluvium loam on the slope unprotected by vegetation.

In 2021 The Cabinet of Ministers of Ukraine decided to approve the establishment of the Kuyalnytskyi National Nature Park in the Berezivskyi and Odesa districts. There is hope that it will solve a number of problems related to the critical ecological status of the Kuyalnytskyi estuary basin.

After analyzing the current state of the Kuyalnytskyi estuary basin, environmental, social and man-made factors influencing it, we propose measures to improve the ecological condition of its lands, their protection, rational use and reduction of anthropogenic impact.

1. The first proposal is a revision of Art. 62 of the Land Code of Ukraine on "Restrictions on the use of land of coastal protection strips along the seas, sea bays and estuaries and on islands in inland waters", supplementing the article with items on the prohibition: cattle burial grounds, filtration fields, etc .; transport access to the water body, its washing and maintenance.

2. Development of a draft detailed plan of the Kuyalnytskyi estuary basin.

3. To restore and establish water protection zones with the removal of coastal protection strips in nature and to organize nature protection control of economic activity within their borders in accordance with the legislation of Ukraine.

4. Reduction of arable land areas along water protection zones and zones with steep slopes where erosion processes develop, as well as degraded, unproductive, technogenic-contaminated arable lands with their siltation to restore the original natural vegetation.

5. Arrange the coastal protection strips and bring the coastal protection strips of the Velykyi Kuyalnyk River, Dovbok, Kubanka, Hildendorfska and Korsuntsivska baulks into nature.

6. Create protective strips of greenery along routes and slopes, as well as along route № 14 as a structural biogeo-barrier preventing the entry of toxins of various origins from the catchment area, landslides and soil erosion.

7. Analysis of water use, main sources of pollution, certification of water bodies and creation of a register of hydraulic structures and their owners in the Kuyalnytskyi estuary basin

8. Create a system for monitoring and a single database on the state of natural resources in the Kuyalnytskyi estuary basin and conducting expeditionary research on the state of resources in the basin.

9. Carrying out an inventory of landfills in the Kuyalnytskyi estuary basin and liquidation of natural and those located within the protection zones.

10. Eliminate quarries for the extraction of sand and stones, clean up the water area and the coast of the Kuyalnytskyi estuary.

11. Organize centralized cleaning of municipal sewage of the estuary.

12. Regarding the placement of "wild recreation", it would be appropriate to create official beaches in accordance with all rules and regulations. For the sake of comfortable and, most importantly, safe recreation of the population, it is proposed to equip several recreation areas on the shores of the Kuyalnytskyi estuary (excluding the beach of the sanatorium "Kuyalnyk") with appropriate conditions, and most importantly equipped entrances for transport. This would reduce the impact on the coastal lands of the estuary.

CONCLUSIONS

Analysis of the ecological condition of the Kuyalnytskyi estuary basin showed that with the current state of the hydrographic network and the estuary catchment basin, progressive economic development of coastal slopes and long-term global warming, the estuary drying processes and increasing pollution of its waters will continue. The most effective way to save the Kuyalnytskyi estuary from degradation is to create a regular water exchange with the sea. However, in any case, this should be preceded by detailed hydrological, hydrographic and ecological studies, which will determine the ways and nature of establishing links with the sea, which allow to restore water volumes and estuary area and avoid negative consequences for its ecosystem.

For the sustainable functioning of the Kuyalnytskyi National Nature Park, it is necessary to create an appropriate regulatory framework, which consists of a system of standards and other regulatory documents, monitoring of resource potential and regulations. This can be achieved by developing a single conceptual mechanism for quantitative and qualitative assessment of existing and maximum allowable man-made load in the catchment area of the Velykyi Kuyalnyk River and other watercourses in the Kuyalnytskyi estuary basin (Dovbok, Kubanka, Guildorf, Korsuntsivska baulks).

In its final form, such an assessment will consist of a clear sequence of actions that will determine the allowable man-made loads; which in turn will significantly reduce financial costs to ensure the stable operation of the water management complex of the Kuyalnytskyi estuary.

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