Problems of land use of water protection zones

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Abstract. The article deals with the problems of irrational land use in the territory of the water protection zone and coastal protective strips. Given examples represent problems of using water protection zones and coastal protection strips on the territory of Krasnodar Territory. Sections of water protection zones and borders of coastal protective strips of water bodies do not always have identification marks, so this does not prevent people from doing their own activities. The movement of vehicles on the territory of the Yasenskaya Spit negatively affects the environment. Due to the analysis, it was concluded that it is necessary to address the issues of using water bodies and land plots within coastal territories in legislation. The article raises the problems of rational use of land as a natural resource, namely, the use of land not for its intended purpose, there were examined the causes of their occurrence and there were suggests the ways to solve them. The problems of location of land plots located in water protection zones of rivers are considered on the example of specific land plots with cadastral numbers 23: 40:0508009:81 and 23:40:0000000:2422. The legal regime of the land use located in water protection zones is considered. A distinction has been made between restrictions on the use of land plots located in the coastal protection zone and the water protection zone. As a result of the research, recommendations are given to the municipal administration on how to use these land plots in the future.

1. Introduction
Currently, the need of environmental justification of projects of rational use of natural resources is widely recognized. For example, water protection zones are established around each water body, which restrict economic and other human activities. A large number of land plots are located in these zones. Prohibitions of various human activities on such lands do not allow to use these land areas more efficiently from an economic point of view. Therefore, there is a need to develop methods of rational and maximum effective use of land plots located in water protection zones [1].

Water protection zones are one of the types of environmental zones created to prevent harmful effects of economic and other activities on water bodies [2]. Thus, water protection zones are territories that are adjacent to the shoreline (borders of a water body) of seas, rivers, streams, channels, lakes, reservoirs and where a special regime is established for the implementation of economic and other activities in order to prevent pollution, clogging, silting of these water bodies and depletion of their waters, as well as to preserve the habitat of aquatic biological resources and other objects of the animal and plant world.

In 2007, important changes were made to the Water Code of the Russian Federation. The amendments radically changed the legal regime of the water protection zone. Previously, according to article 102 of the Land Code of the Russian Federation, water protection zones belonged to the lands...
of the Water Fund, but with the changes that have come into force, such zones are now established on lands of all categories, if such lands are adjacent to a water object [3]. In this regard, there is a special regime of land use, and certain restrictions are imposed on land plots that fall into water protection zones. In this regard, landowners and land users have certain problems with the use of their land plots. In addition, coastal protective strips are established within the borders of military protection zones, on the territories of which additional restrictions are imposed on economic and other activities. The Article 65 of the Water Code defines the concept of water protection zones and coastal protection strips, their length and restrictions on them. The purpose of this scientific work was to reveal the problems of rational land use in water protection zones of water bodies.

2. Materials and methods

The subject of the research is the rational use of land resources in the water protection zone of the Mezyb river and the natural complex Yasenskaya Spit. The materials were obtained from the analysis of satellite images of the territory of these objects in the Google Earth program. The land plots with cadastral numbers 23: 40:0508009:81 and 23: 40:0000000:2422 located in the MF city-resort Gelendzhik and the coastal natural complex "Yasenskaya Spit" located in the MF Primorsko-Akhtarsky district of Krasnodar Territory were selected as the objects to perform the research. The information base of the research was made up of normative legal acts in the field of government bodies of the Russian Federation, adopted in different years, as well as reference materials and scientific literature reflecting the problems of using land resources located in water protection zones. Soil safety data was obtained according to GOST and methods in accordance with OST 10 294-2002 "Standard of Industry. Agricultural lands of the steppe zone of the Russian Federation". Works were carried out on complex agrochemical and ecological-toxicological soil examination in accordance with the regulations and legal acts of the Ministry of Agriculture of the Russian Federation.

3. Results

Krasnodar Territory is rich in water resources, both surface and underground. Among the regions of the southern Federal district, it ranks second in terms of the density and length of the river network. Water protection zones are established around each water body that restrict economic and other human activities in order to maintain ecological balance [5].

For clarity, let's consider some problems of land use in water protection zones on the example of two different cases.

First case. Both land plots were established in 2013. Plot 23: 40:0000000:2422, with an area of 2.93 ha – is old agricultural land surrounded by forest, and a small plot 23:40:0508009: 81, with an area of 887 m², with the exception of its part located in the the Mezyb water area, is covered with forest vegetation.

According to the data of the Public cadastral map, both land plots have the type of permitted use - "placement of physical culture and sports facilities", the land category – land of localities [3]. At the same time, there is a reason to believe that the forest on the site 23:40:0508009:81 during the construction of these facilities will be destroyed.

The inclusion of land plots covered by the water surface of the river occurred as a result of incompetent work of the cadastral engineer, who carried out their surveying and did not take into account that the boundaries of land plots "went into the water" and captured the river bank, which also cannot be transferred to the ownership.
The article 65 of the Water Code of the Russian Federation establishes the legal regime for the land use in water protection zones [4]. The width of the strip that is not allowed to be built depends on the length of water bodies. The Mezyb river has a length of 18 km, therefore, according to the Water code of the Russian Federation, the width of the water protection zone of the Mezyb river is 100 m, and the coastal protective strip is 30 m. Since these land plots are located in the water protection zone, the construction of physical culture and sports facilities is not allowed [5].

Based on the identified problems, we can suggest to the administration of the municipal formation of the resort city Gelendzhik to carry out works on adjusting the boundaries of these land plots in order to exclude the water body of the Mezyb river and conduct the procedure of changing the type of a permitted use for “the placement of physical culture and sports” to "recreation (leisure)" [7]. According to the classifier of permitted uses, the type with the code 5.1-5.5 "Recreation" is intended for walking or riding, recreation and tourism, nature observation, picnics, hunting, fishing, etc. The authors believe that this will not create a high burden on water resources. According to Article 6 of the Water Code, the strip along the shoreline of a water body is intended for general use. Every citizen has the right to use (without the use of motor vehicles) the coastal strip of public water bodies for movement and stay near them, including amateur and sport fishing [4]. Also, it is necessary to evaluate land plots taking into account the agro-climatic factor.

Second case. The Yasenskaya Spit and Beysugsky Estuary, being an integral natural complex, represent a unique wetland that plays a significant role in maintaining the hydrological regime of the Sea of Azov and stabilizing the ecosystem that has developed on its eastern coast. The land serves as a permanent and temporary habitat for waterfowl including those listed in the Red Book of the Russian Federation, being one of their most important transit points for migratory birds on the eastern shore of the Sea of Azov. These territories also belong to the Ramsar Convention, which are subject to state regulation of agricultural activities along the banks of reservoirs and in places where waterfowl congregate.

The Yasenskaya Spit and the Beysugsky Estuary are a buffer (protective) zone between the Sea of Azov and the territory of Borodinsky, Brinkovsky rural settlements of Primorsko-Akhtarsky district and Yasenskoye rural settlement of Yeisk district, providing, on the one hand, protection of
settlements and farmlands from flooding, and on the other - preventing the removal of pollutants to the sea. Also, these objects have a close hydrological and ecological relationship with lake Khan, and it is necessary to solve the problem of preserving all these territories and water areas in a complex and interconnection. The Beysugsky Estuary and the rivers Beysug and Chelbas that flow into it play a key role in the reproduction of aquatic biological resources of the Sea of Azov - roach, walleye, bull fish, pelengas, Azov herring, carp, crustaceans and other commercial species.

The Yasenskaya Spit and the Beysugsky Estuary are in an unfavorable ecological state, which is expressed in the degradation of beaches on the Yasenskaya Spit, the destruction of forest plantations, the violation of water exchange between the Sea of Azov and the Beysugsky Estuary, the deterioration of water quality (especially in the summer) causing overseas phenomena.

The unfavorable situation of the natural complex is caused by a number of reasons related to both natural processes and irrational economic activity: the construction of roads, dams without approval and expertise, the actual lack of systematic state environmental control of monitoring of the state of wetlands.

Among the main causes of adverse environmental conditions of the Yasenskaya Spit and the Beysugsky Estuary should be noted: - the wrong engineering solution in the road construction of the village Yasenskaya – the village Yasenskaya Pereprava in Yeisk district, which led to the phenomenon here deaf dams, directing the energy of surge currents in the direction of the Yasenskaya sandbar that contributes to its intense destruction. The highway was supposed to have duckers that let water through. Ongoing measures to protect and strengthen the road further aggravate the situation; - overlap of the arm at the base of the Yasenskaya Spit, which historically connected the Sea of Azov and the Beysugsky Estuary, providing water exchange between them, serving as one of the spawning routes for passing fish, as well as for passing into the estuary of excess sea water during wind-driven events in the Yasensky Bay; - ineffective solution in terms of protecting the outer (sea) shore of the Yasenskaya Spit from erosion, expressed in attempts to create an artificial beach here; - violation of forest management conditions on the Yasenskaya Spit in the absence of monitoring of the soil and vegetation cover of the spit, as well as unauthorized laying of channels.

One of the problems of the water protection zone of the Yasenskaya Spit is the movement and parking of vehicles (except special equipment), except for their movement on roads and parking in specially equipped places. Each water body has its own borders of the water protection zone [9, 11]. So for the Sea of Azov, the water protection zone is 500 meters, the same width as for the Beysugsky and Akhtarsky estuaries adjacent to the sea, since the Yasenskaya Spit is in the water protection zone.

At the request of the district administration, the work is underway to prevent violations on the Yasenskaya Spit as there were many violations. For many years, The Spits has been a favorite holiday destination for residents of the Primorsko-Akhtarsky district and guests from all over Russia. Often vacationers do not know that they are committing violations in the water protection zone and are very surprised of it. There are no prohibiting or informing signs, or they are just ignored. One of the solutions is to put a barrier and prohibit any movement of vehicles other than special ones and conduct explanations with citizens and continue the raids. You can take into account the wishes of citizens. In their opinion, the Yasenskaya Spit, its sandy shore is a great place for children's recreation. The solution is to make a fenced protected area where people will enjoy their holidays, rather than moving along the coastline by transport. The district is interested in preserving both natural resources and developing an economically profitable tourism industry. I would like to believe that the problem with the Yasenskaya Spit should eventually find a compromise solution, then the natural coastal complex will remain and people will be able to use recreational resources freely.

In addition to the rational use of land resources, it is necessary to understand the impact of human activities on the natural environment, including agriculture. Ecological monitoring of agricultural lands in Krasnodar Territory is carried out by the agrochemical Service of Krasnodar Territory [10]. According to the data of 2019, the service carried out works on ecological and toxicological assessment of agricultural land soils. Heavy metals, residual pesticides, nitrates, and radioactive substances were found.
Ecological and toxicological land assessment in agricultural products was carried out by local monitoring studies on permanently fixed stationary areas of the region, as well as by performing a comprehensive agrochemical survey of soils, selectively in mixed samples selectively.

During radiological control, strontium-90 and caesium-137 were determined from the most toxic and long-lived radionuclides. In addition, radium–226, thorium–232, and potassium–40 were measured at reference sites.

Radiochemical analysis of soil and agricultural products for strontium-90 was performed by oxalate deposition, in combination with beta-radiometric and beta - spectrometric measurements, and caesium-137 by gamma–spectrometry.

Radiometric measurements were performed on a gamma-beta spectrometer using the “Progress” software, and the Gamma background of the area was determined by the DRG-01T1 device.

During analytical control of pesticide residues in soil and agricultural products, special attention was paid to highly resistant and highly toxic substances. Organochlorine compounds and copper-containing preparations were determined.

Residual amounts of pesticides were determined by gas-liquid chromatography on chromatographs "Tsvet-500M" and "Tsvet 800".

The heavy metal contamination assessment included the number of gross and mobile connections. Substances belonging to the first and second hazard classes were determined: mercury, lead, arsenic, zinc, copper, and cadmium were obtained from toxic elements.

Arsenic was determined by colorimetric method, mercury - on the device "Yulia-5K", other heavy metals were determined by atomic absorption method on the device "Kvant - 2A".

The standards of the Russian Ministry of Health and the agrochemical service system were used as a basis of assessing the levels of contamination.

| Name of districts and cities, service areas | Humus content (weighted average), % | Mobile phosphorus content (weighted average), mg / kg of soil | Content of exchange potassium (weighted average), mg / kg, pH | Acidity (weighted average), pH | Lead (movable form), mg / kg | Cadmium (movable form), mg / kg | Copper (movable form), mg / kg | Zinc (movable form), mg / kg | Arsenic (gross form), mg / kg | Mercury (movable form), mg / kg | ∑D DT |
|-------------------------------------------|-----------------------------------|------------------------------------------------------------|----------------------------------------------------------|----------------------------|----------------------------|-----------------------------|-----------------------------|-----------------------------|--------------------------------|-----------------------------|---------------|
| Primorsko-Akhtarsk                        | 3.4                               | 23                                                         | 521                                                      | 7.1                          | 1.08                       | 0.046                       | 0.110                       | 0.26                        | 6.6                             | 0.012          | 0.001         |
| Gelendzhik                                | 2.7                               | 54                                                         | 122                                                      | 6.2                          | 0.39                       | 0.070                       | 1.500                       | 2.4                         | -                                | 0.017          | 0.001         |

According to research data, the lead content in soils of the surveyed areas is in the range of 0.39-1.08 mg / kg, which corresponds to a very low content. Excess of the maximum permissible concentration of lead in farms was not detected.

**Lead.** The factors that affect the accumulation of lead in the soil are almost the same as those of cadmium, zinc, copper, etc.
Cadmium. The content of mobile forms of cadmium, an element of the 1st hazard class, is in the range of 0.046-0.070 mg/kg.

One of the reasons of its accumulation in the soil are natural soil-forming factors, long-term use of mineral fertilizers, etc. Its half-life from the soil is one of the longest (1100 years). Even in very small amounts, cadmium has a large toxic effect. Due to its high mobility in the soil, its accumulation in agricultural products can occur even when its content in the soil is less than the hygienic standard. The detected amount of cadmium in the analyzed samples did not exceed the permissible level.

Copper. It is one of the main trace elements. In large quantities, it is a toxic element of the 2nd hazard class. The content of its gross forms in farm soils varies between 0.11-1.5 mg/kg.

Zinc. One of the main microelements that determines and regulates many life processes. At the same time, in high concentrations, zinc is a toxic element. According to its toxicity, it belongs to the 1st hazard class.

According to research results, the zinc content in soils is within the range of 0.26-2.40 mg/kg. This distribution of zinc in soils falls within the framework of the generally accepted theory of transformation of heavy metals in agroecosystems, depending on the natural characteristics of soil and their total intake with precipitation and chemical means. The amount of zinc above the maximum permissible level in agricultural land was not found.

Arsenic. Arsenic, an element of hazard class 1, occupies a special place among all the studied pollutants. Our researches have established a relatively high content of arsenic in soils of agricultural land surveyed farms.

In the conditions of Krasnodar Territory the arsenic contamination of the existing standards are at the very high levels, apparently, due to neither so much anthropogenic (emissions, introduction of agrochemicals and etc.), nor much natural factors (soil genesis of Krasnodar Territory’s soils, nature of parent rocks, mineralogical composition, etc.). Based on this, the existing principle of development of maximum permissible standards for soils by the state sanitary and epidemiological service probably needs to be improved. More detailed differentiation of the dependence of arsenic content on soil properties is needed.

It should be noted that the relatively high arsenic content found in the soil does not have a negative impact on adjacent environments. The amount of arsenic in agricultural products grown does not exceed the maximum permissible concentration (data from certification studies).

Mercury. Hazard class 1 element, highly toxic. Mercury is not a common element in the environment. According to the research of the agrochemical center, the content of this metal in soils ranges from 0.017 to 0.021 mg/kg. Soils with mercury content which higher than the maximum permissible concentration were not detected. The detected amount of mercury is related to background contamination and does not pose a risk to human health.

Selective control of soil samples showed that in most cases, remnants of organochlorine pesticides were found in the surveyed fields. In general, their content was below the maximum permissible concentration (MPC). The exception is, as a rule, agricultural land under perennial plantings and fields adjacent to chemical warehouses, chemical solution units and air runways.

According to the criteria of environmental assessment of the land state, the territory with excess of sanitary standards at the level of 1 MPC is considered relatively satisfactory, with excess of standards above 2 MPC is considered as an emergency.

Thus, our researches allow us to conclude that according to the criteria of environmental assessment of the land state, it is possible to grow clean agricultural products on agricultural land with such a level of pollution.

4. Summary
The main approaches to solving the identified problems are as follows:
- For conservation and restoration of natural systems of and the Yasenskaya Spit and the Beisugsky Estuary in their close relationship with lake Khan, maintaining the ecological balance of these areas
should be excluded here the forms of economic activity, entailing a violation of the natural landscape, damage to planted forests and soil and grass cover, hydrological regime of water bodies.

- Conduct an inventory of existing hydraulic structures on the rivers Beysug and Chelbas.
- Explore the possibility of strengthening the body of the spit and its beaches with grassy and shrubby vegetation.
- Take the necessary preventive measures to prevent burning of dry vegetation on the Yasenskaya Spit, the banks of the Beisugsky Estuary and the lake Khan.
- Recommend to the Ministry of Transport and Road Economy of Krasnodar Territory to reconstruct the section of road between the khutor Shilovka and the settlement. Yasenskaya Pereprava in such a way that free passage of sea water into the bowl of the lake Khanskoye was provided in case of wind-driven events.
- Recommend to the administration of Primorsko-Akhtarsky district to ensure full compliance with the regime of the district of sanitary protection of the resort of local significance "Yasenskaya Spit", established by the resolution of the head of administration (Governor) No. 826 of Krasnodar Territory dated August 2, 2011 "On approval of the borders and regime of the district of sanitary protection of local resorts Primorsko-Akhtarsk and the Yasenskaya Spit in Krasnodar Territory".

The state is responding to the problem positively. In November 2019, the Ministry of Natural Resources of Krasnodar Territory created a specially protected natural area (SPNA) of regional significance: the coastal natural complex "Yasenskaya Spit" in the municipality of Primorsko-Akhtarsky district. This status will ensure the ecological balance of the resort. Logging, storage of garbage, implementation of harmful emissions and construction of capital facilities will be restricted on the territory of the facility.

Separately, when using land within water protection zones and setting their borders, it is necessary to take into account the data of environmental monitoring, including the quality of soil.

Two cases considered in the article demonstrate clearly the problems of land use in water protection zones of water bodies. And such cases are not few. This indicates the urgency of the problem [12, 13].

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