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INFLUENCE OF KALMYKIA WATERS ON NATURE OF SURROUNDING AREAS AND THE ENVIRONMENT

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Abstract

In recent years, reservoirs have been one of the leading factors in environmental change in almost all countries of the world. This is especially true for the territory of the Republic of Kalmykia. It is the only territory in Europe where there are vast areas of deserts. The purpose of this work is to identify the current state of artificial surface waters, in particular reservoirs, on the state of ecology and technogenic safety in the region. The problem of the influence of pools in the lower reaches and on the canal pools of reservoirs is their impact on the environment, ecology. The data on the demand for reservoirs and optimal operating modes have not been identified. The evaporation from the water surface is very high. Many surface water bodies dry up in the summer. Kalmykia is not provided with water resources for industrial, agricultural and social needs. To solve the research tasks, the data on surface waters in the republic were studied. The initial materials were the work of students, performed during the period of practical work and participation of visiting expeditionary routes in recent years. Also, literary and archival data on the topic of work and public Internet resources were used. The main hypothesis of the study was the ecological and economic theory of balance in the natural environment and its entropy of order. The research results will be useful for ministries and construction organizations in the assessment of surface water resources during their reconstruction and maintenance.

Keywords: Kalmykia waters, nature, the environment

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1. Introduction

The purpose of the study is to assess the current state of reservoirs located on the territory of the Republic of Kalmykia and their impact on the environment. For this, the current state of large reservoirs was analyzed by the standards of republican significance. The forecast of their condition was given.

The reservoirs created mainly in the 60s of the last century due to the processes taking place in them (Onkaev et al., 2012; Sangadzhiev, 2015) require special attention and care. The durability of an object depends on human activity. Reservoirs, being water bodies affect the environment. These issues were considered in more detail in monographs (Andronikov, 1979; Reservoirs and their impact …, 1986). They highlight a complex of problems associated with reservoirs in different countries of the world and methods for studying soils. The purpose of the research is to consider the issues of local territorial significance, in particular, the Caspian region of the Russian Federation. The number of factors affecting the entropy of order in the reservoir-man system increases with time. The equation becomes more complex. We tried to analyze how to solve these issues and how they are related to the environment and technosphere.

Another factor is time factor. Nothing is eternal. We need permanent supervisory organizations that would monitor the coast, the influence of pools, wind, etc. These organizations do not exist. Another factor is that the created reservoirs have formed new infrastructure around them. This allowed keeping the state of objects in the proper condition. Garden plots, gardens and parks appeared, which reduced the influence of climate, dust, etc. on the environment. For example, in America in recent years, the volume of reservoirs has increased by 30–35 times. The same situation is on other continents. They began to build new artificial lakes and reservoirs.

2. Problem Statement

The problem mainly is in the impact of reservoirs on the environment. In recent years the data on the impact on the environment have hardly been updated. Local departments and ministries conduct their own studies. However, there is still no single program.

3. Research Questions

The studies were carried out during the period of expeditionary routes through the regions of the Republic of Kalmykia over the past five years (Sangadzhiev, 2015). Some water and soil samples were taken. The coastline of reservoirs and the formation of pools were described. This was the Chogray reservoir located on the border of Kalmykia and the Stavropol Territory. It is the main water source in the south of Kalmykia. It is mainly filled with the waters of the Kuma River (Sangadzhiev, 2015). At this time, it almost does not supply fresh water. This is associated with the discharge of drainage water from the lands of the Stavropol Territory. There is also a reservoir "Deed Khulsun" in Yashkul district of the Republic of Kalmykia. In addition, there is a network of small lakes-reservoirs.

The field geographic factors of the formation of the Earth as a whole and specifically in the zone of the Caspian lowland on the territory of modern Kalmykia were studied. In particular, Reed G. and co-

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authors considered questions of the history of the Earth, both in general and at a later stage of its development (Reed & Watson, 1981). The same questions were considered by Flint in the monograph "History of the Earth" (Flint, 1973). The history of the Earth under the sea and the ocean was considered by Shepard (1964). These two works showed the history of the formation of the Earth from the oceans to the present state. Although these works contained a lot of averaged data, the authors tried to show changes in all processes. Starting with tectonic changes and up to modern geographical processes, i.e., terrain changes.

The Republic of Kalmykia is territorially located in the southeastern part of Russia. It is in the zone of steppes, deserts and semi-deserts. The territory is located in the south of the East European Plain. The main part is occupied by the Caspian lowland. The western part is the Ergeninskaya Upland. The climate of the Republic of Kalmykia is not even: continental turns into sharply continental. Lack of rain moisture and high evaporation from the water surface of reservoirs are typical of Kalmykia. In the geological aspect, this is the Ergeninskaya Upland with a mark of + 140–150 m above sea level. Climatically it is a zone with temperatures in summer reaching up to 45 C in the shade and strong winds (up to 30 m/s). Winds also often blow in winter (Sangadzhiev, 2015).

The water supply of the republic does not meet the needs of industrial organizations, agricultural enterprises and social needs. Almost all streams dry up in the summer.

The water of rivers and lakes is highly mineralized. It reaches up to 15 mg/l and more and is not suitable for household and drinking purposes. All surface runoff remains on the territory of Kalmykia. The main part of the runoff is accumulated in ponds and reservoirs, where it is lost due to evaporation and filtration. A part of the runoff from reservoirs, lakes and rivers is used in land reclamation, irrigation and agriculture.

In 2005, an inventory control of hydraulic structures was carried out. As a result it was found that there were 189 water bodies on the territory of the Republic of Kalmykia, of which 166 reservoirs, 9 flood protection structures, 14 lakes of national economic importance (Sangadzhiev, 2015).

Hydraulic structures of water bodies were in the following technical condition: satisfactory – 91 units and requiring major repairs or reconstruction - 98 units. In recent years, these figures have not changed, since the republic is not provided with funding and the settlements are mostly at the stage of dissolution or collapse.

Most of water in the reservoirs comes from the slopes of the Ergeninskaya Upland. In particular, this is its southeastern part. The employees of the department of construction considered the issues of wastewater use and their current state (Degtyarev, 2020; Report on the state and use …, 2010). Geological and geographic-economic indicators and the relationship of human economic activity were studied (Degtyarev, 2020). The western regions of the republic (west of Yergeni) were also studied, where the water supply was higher compared to other regions of the Republic of Kalmykia (Sangadzhiev, 2015).

The issues of the current state of waters, monitoring of the lithosphere and engineering-geological zoning were studied in detail. The issues of the current state of water resources in the republic and the dependence on zoning were considered (Sangadzhiev, 2015).

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The works published earlier on the reservoirs of the world and Russia were taken into account (Reservoirs and their impact …, 1986). Sands, dry winds, dust storms also left a mark on the coastal part of reservoirs, the formation of pools and the reliability of coastal fortifications. All the results used in the work were collected during expedition routes to the regions of the Republic of Kalmykia. These were water and soil samples. Difficult climatic conditions, especially temperature fluctuations, accelerated the process of destruction of the coastline of the reservoir.

4. Purpose of the Study

The purpose was to assess the current state of reservoirs located on the territory of the Republic of Kalmykia and their impact on the environment. For this, the current state of large reservoirs was analyzed by the standards of republican significance. The forecast of their condition was given.

To answer this question, we analyzed the literature on this topic and divided it into 3 sections:

The data on the geotectonics of the formation of the Caspian lowland and the territory of modern Kalmykia (Oliver, 1984). The data on the methods of paleogeographic research were taken into account. The history of tectonics in general aspect and the influence of deformations in the earth's crust on the modern landscape in the Caspian lowland. After the departure of the waters of the Tethys Ocean, three seas were formed: the Caspian (Khazar) Sea, Black Sea and Mediterranean Sea. However gradually, due to deformation in the earth's crust, tectonic shifts, these seas took on their current state (Novikova, 1997).

Modern problems of geotectonics of the Earth (Draika & Shmita, 1984). The data on the methodology of geoecological zoning were used, where the role of surface and groundwater was most important. The problems of soil erosion and landscapes of river valleys were studied (Krasichkov, 1974).

Modern research on water resources, ecology in the study area (Sangadzhiev, 2015). The paper showed modern approaches to engineering geology (Onkaev et al., 2012) and interactions between geology and humans. In these papers the main link in the anthropogenic impact on the environment and water resources was man with his new technologies.

5. Research Methods

Literary and Internet resources on the subject of the article were studied. The authors used field surveys of water bodies in the republic and water and soil sampling was carried out. The water was tested for mineralization, i.e. the composition of chemical alkaline compounds, which, reacting with clay, quartz or sand, destroyed the coastline. The study of the process of the pools was carried out by measuring the coastline in the time interval. The wind, forming waves, destroyed the banks of reservoirs.

Aerial photography methods were also used, in particular, panoramic photographs were taken using quadrocopters from different heights (no more than 1000 m above sea level) (Andronikov, 1979). The shooting was carried out in the morning and evening hours. This was due to strong winds and air currents in the atmosphere. We used photo materials received from satellites from Internet resources that were in free access.

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5.1. Problem statement

Complex climatic characteristics of the region, high mineralization, lack of financial influence, the collapse of small settlements led to the destruction of the geometry of reservoirs. These issues led to the study of the topic on reservoirs in the Republic of Kalmykia. First, all of them must go through an inventory control, divided into groups: small, medium and large. As a standard, it is necessary to take the area of the water mirror and the volume of water of the Chogray reservoir. Next, it is necessary to take away to medium reservoirs with water reserves and water surface from 50–75 %. Everything less should be attributed to small group.

It is advisable to build small sewage treatment plants to purify water on the coastlines. Next it is necessary to drain the purified water back into the reservoir and also this water may be used for watering the plant layer around the reservoir. Trees and shrubs must be planted. It is necessary to clean the bottom of the reservoir and check the canal pools at least every 2 years. Moreover, the recreation areas must be arranged. We offer energy from renewable sources such as sun, wind and biogas. It will also lower the prices of the tourism system**.**

6. Findings

The main problem is the technical condition of the existing reservoirs and their mineralization. It is necessary to build special recreation areas using the energy of the sun, wind and biogas.

7. Conclusion

The recreation areas will allow Kalmykia to develop the tourism industry. Moreover, they will allow young people to organize a recreational and ecological type of tourism. As a result, schoolchildren and students will have an internship in the summer mastering their knowledge in geography, geology, ecology and technogenic safety.

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