

THE IMPACT OF A HYDRAULIC STRUCTURE ON THE ENVIRONMENT AND THE STATE OF GROUNDWATER

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ABSTRACT

The article examines the issue of the influence of hydraulic structures on the environment and on the state of groundwater. When creating a hydraulic structure, it is explained to study the combined influence of all factors, taking into account the prospects for construction, and take measures to maintain the quality (including groundwater) of water.

Keywords: *Groundwater, Groundwater Level, Hydraulic Engineering Structures, Groundwater Monitoring, Observation Bore Wells, Formation Zone*

INTRODUCTION

In arid regions of the globe, in particular in Central Asia, the vital activity of the population and economic development are inconceivable without the use of hydraulic structures, especially reservoirs, as the main regulators of the regime of river flow in the region (Avakyan *et al.*, 2014).

In the process of economic development in the countries of the Central Asian region, especially in the Republic of Uzbekistan, large hydraulic structures have been built, including a large number of channel and bulk reservoirs for complex purposes.

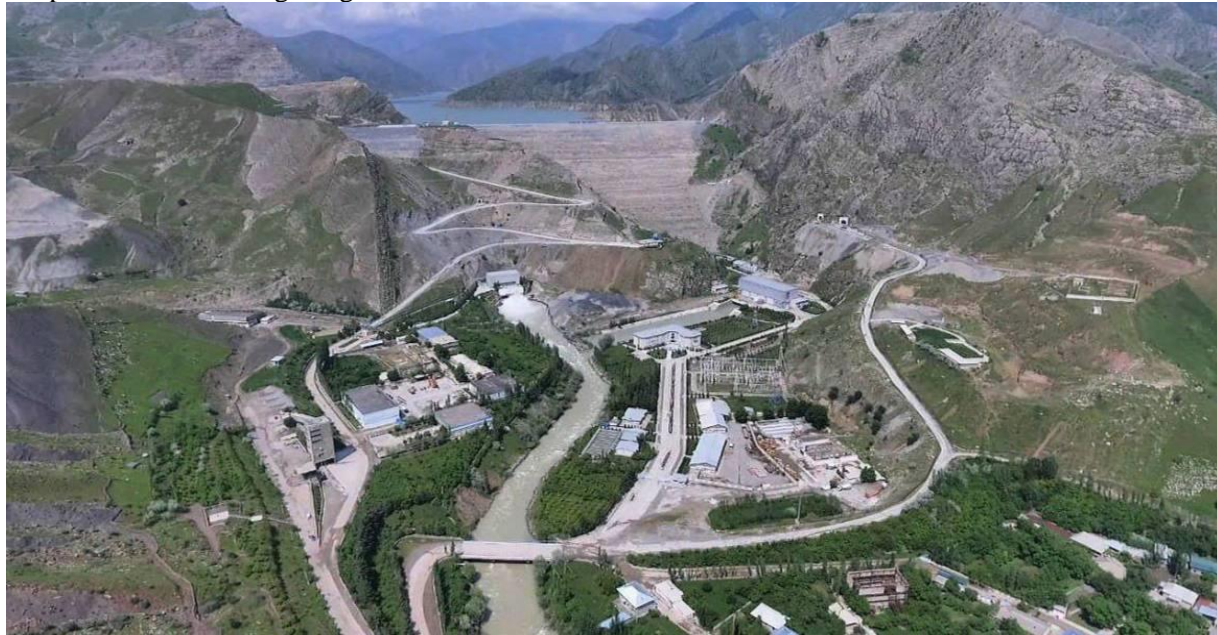
The creation of reservoirs is one of the most effective ways to solve water supply problems by actively regulating and redistributing river flow over time in the interests of economic sectors. Reservoirs play an important role in the development of agriculture, energy and industry in the country. Over 50 large reservoirs and numerous small reservoirs are operated in Uzbekistan, which are mainly used for irrigation needs.

The flow regime in reservoirs is complex. The ongoing hydraulic and morphological processes in reservoirs associated with riverbed erosion and sediment transport, as well as practical tasks arising from the interaction of the stream with engineering structures located in the reservoir area, are among the most difficult problems of river hydraulics, riverbed process and hydraulic engineering.

The impact of reservoirs on the natural environment, in particular on landscapes, is huge, because hydraulic structures have different shapes, volumes, areas, in addition, they combine a whole complex of certain hydraulic structures and their impact on the natural environment has a different orientation, in different effects on natural objects. Modern reservoirs are complex man - made systems and have different directions. They are mainly built-in river valleys, where dams are built for this purpose. A natural water body appears in front of the dam in natural depressions or in riverbeds, and a reservoir is created. It has a different functional orientation, the area of flooding, shape, depth, coastline, zone of direct and indirect influence. In this regard, the reservoir and related hydraulic structures have a different impact on the natural environment. Uzbekistan has a large number of hydraulic structures on weak soils. (loess, loess-like rocks, sands, quicksand, etc.). The reliability of such structures is insufficient, since when critical filtration rates are reached in the bases, along the sides and other structural elements, soil particles are removed or the degree of salinity of rocks is relaxed during wetting, which leads to their destruction and a number of leaks from channels and rivers. The damage and losses caused by such phenomena are obvious, which is unacceptable

and requires research (Picture 1).

These phenomena require attention and now it has become relevant, first of all, to provide PV monitoring services with scientific and methodological manuals and recommendations. This is due to the fact that in the past, allied institutions were engaged in such developments, and moreover, without taking into account the peculiarities of the geological structure of Uzbekistan.



Picture 1. The picture of hydraulic structures.

In scientific terms, the generalization of data on Uzbekistan will make it possible to fill the gap in knowledge of the specifics of the design of irrigation facilities on saline, flooded and other weak soils.

In practical terms, the groundwater monitoring service, with guidance or recommendations, will be able to predict the formation of such special tasks and conduct research.

Timely detection and prevention of such phenomena will help to prevent damage and losses caused by them.

Reservoirs are a powerful factor in the transformation of the environment, a source of potential danger in the territories where they are located. That is why the study of all possible consequences of the creation and operation of artificial reservoirs is an important aspect of the problem of ensuring the safety of the population and territories. In conditions of increased anthropogenic pressure and emerging climate changes, these studies are becoming particularly relevant (Shajalilov *et al.*, 2001).

When considering the impact of hydraulic engineering facilities on the environment, it is necessary to distinguish between the construction period and the period of their operation. The first period is relatively short-lived - several years. At this time, the natural landscape in the construction area is disrupted. The rise of the water level in the upper reaches usually begins during the construction period. As a result of the filling of the reservoir produced during this process, the costs and water levels in the lower reaches change. When creating reservoirs, it is necessary to carefully study the combined influence of all factors, taking into account the prospects for construction, and take measures to maintain the quality (including groundwater). Water quality is a characteristic of the composition and properties of water, determining its suitability for specific types of water use.

The creation of reservoirs leads to flooding of the territory. Agricultural lands, mineral deposits, industrial and civil structures, ancient monuments, roads, forests, permanent habitats of animals and plants, etc. may fall into the flood zone. The most populated and developed are the riverine sections and areas at the mouths

of tributaries. There is little agricultural land on the mountain slopes, and there are usually no industrial facilities there. Therefore, the creation of reservoirs in mountainous conditions causes significantly less damage than on the plains (Vasiliyev *et al.*, 1987, and Savchenko *et al.*, 1999).

Due to the rise and decrease of the water level in the reservoir, when regulating runoff and wave phenomena, the shores of the reservoir are being processed. It consists in the erosion and collapse of steep slopes, cutting off capes and braids. The size of the processing of the shores depends on their geological structure, the regime of water levels, the depth of the reservoir, the configuration of the shores, winds, etc. The relative stabilization of the shores occurs 5-20 years after the filling of the reservoir [Vendrov *et al.*, 1961, and Reteyum, 1970]

The flooding of the lands adjacent to the reservoir occurs due to the rise of the groundwater level. In the zone of excessive moisture, flooding entails negative consequences – waterlogging of plant roots and their death. With a change in the water-air regime of soils, their waterlogging may occur, which worsens the quality of the soil and reduces its productivity. In arid areas, flooding improves the growing conditions of plants at appropriate depths of soil waters. In adverse conditions, soil salinization may occur.

MATERIALS AND METHODS

The influence of a hydraulic structure on groundwater should be considered, divided into three groups.

1. Favorable. Under such circumstances, it is considered that the impact of the reservoir on groundwater is minimal. But this option is not very suitable for this territory. Since the reservoir is sufficiently watered at this point. In this case, it is recommended to lay observation wells in the direction where the groundwater level is high and flooding zones are observed. The observation point should be set in the direction of Lake Balykly. There are several canals and several fish ponds and there is a tendency for the groundwater level to rise. This area is used for agricultural purposes and is covered by a drainage network.

2. Conditionally favorable. Currently, seismicity is considered as one of the manifestations of global environmental changes reflecting the nature of geodynamic processes. At the same time, the existing connection between the safety of pressure hydraulic structures and the seismic factor makes it relevant to study and predict any possible changes. At the same time, the proximity of fault faults of any order adversely affects. Generalization of world experience allows us to conclude that the creation of reservoirs in earthquake-prone areas can increase the frequency of their occurrence. According to most researchers, when large volumes of water are concentrated in river valleys, stresses are redistributed in the earth's crust, which causes earthquakes. This phenomenon is commonly referred to as "induced" seismicity.

In this case, it is recommended to lay observation wells in the direction where the alleged fault faults pass. To do this, it is necessary to carry out geophysical studies to more accurately determine the location of fault faults, where the line of the alleged tectonic disturbance and the highest level of groundwater passes.

3. Unfavorable. The creation of reservoirs inevitably leads to manifestations of "new" exogenous geological processes, such as abrasion of coastal slopes and directional deformation of the channels of regulated rivers. The scale and degree of coastal abrasion in the new water cut zone are determined by a different combination of zonal and azonal factors, with the following playing a leading role: the intensity of wave action, the level regime of reservoirs, the morphology of coastal slopes and the properties of the rocks composing them. The most intensive processing is observed in the initial period of operation of the hydroelectric power plant.

CONCLUSION

For the safety of the dam, it is recommended to lay observation wells in the area of the upper and lower reaches of the reservoir. This makes it possible to monitor changes in the mineralization of groundwater and, consequently, changes in the amount of salts in the soil structure.

Thus, the impact of reservoirs on the state of the environment today requires close attention and study. Timely assessment and forecast of possible changes can be carried out only on the basis of in-depth study and analysis of the patterns of formation of natural ecosystems, as well as the impact of man-made processes

on them.

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