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HYDROTECHNICAL CONSTRUCTION IN THE TERRITORY OF UZBEKISTAN IN ANCIENT AND MEDIEVAL CENTURIES

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Annotation: The article discusses the traditions of building hydraulic structures in difficult terrain since ancient times. The unique characteristics of the landscape and socio-economic conditions in the territory of Uzbekistan have led to the development of hydrotechnical structures from the simplest local building materials - stone, wood, clay. In the past, it was possible to build large irrigation facilities, create dams, distribution irrigation facilities, etc., to transport water over difficult terrain. A large part of the experience of the past does not lose its importance even today, especially in the rural areas. Therefore, hydraulic engineering deserves the attention of modern researchers.

***Keywords*:** hydrotechnical structures, construction, architecture, Uzbekistan, aqueduct, aqueduct, water distributor.

Introduction Water is necessary for all life processes on earth. Water is of great importance in human activities. There are large amounts of water reserves on the globe. The total water reserves on the globe are 1.5 billion cubic km, of which 97.2% is salty water, 2.15% in form of solid salt, and only 0.65% is fresh water.

The amount of fresh water necessary for human activity is limited, so it is necessary to use it wisely. Despite the fact that 6001 liters of water are needed for human daily needs, it is somewhat difficult to achieve this standard. In most large cities of the world, this amount is less than 2001 (per person).[1]

Water is unevenly distributed on the surface of the earth by region and time. In some regions, there is constant drought, and in some regions, the amount of water is excessive in the spring, causing great damage to the national economy, and in other periods of the year, there may be a shortage of water in this region. In order to eliminate the imbalance in the distribution of water and to deliver a certain amount of water at the right time in this region, it is necessary to implement a number of valuable engineering measures. Water resources play a very important role in ensuring the economic development of our country. Water is used in all sectors of the national economy and in the life activities of the population.

The main water reserves of the Central Asian countries are located in the Chotkal, Pamir-Aloy and Tian Shan mountain ranges. 70-80% of the water reserves of Central Asian countries are located in the mountainous regions of Tajikistan, Kyrgyzstan and Kazakhstan. In these areas, 126.9 billion cubic meters of water are formed in a year. Today, irrigated agriculture is practiced on about 8 million hectares of land located in the territories of Central Asian countries. The total amount of water formed in the Aral Sea basin is 15,750 cubic meters per hectare of irrigated land. In the Republic of Uzbekistan, an average of 67 billion cubic meters of water is consumed in a year, of which 50 billion cubic meters are used for irrigated agriculture. That is, on average, 11-12 thousand cubic meters of water per hectare of irrigated land. [2]

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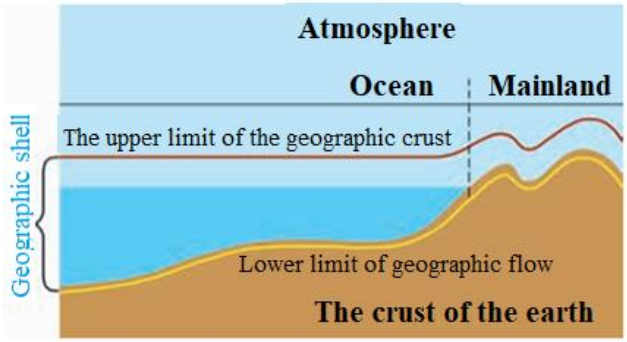
The total volume of water formed in the territory of Uzbekistan does not exceed 8-10 billion cubic meters, and about 1000 cubic meters of water is used for each hectare of irrigated land.

Methods The uneven distribution of water across the territory of our country increases due to its seasonal changes.



The nature of water supply of rivers has a great influence on the division of the water balance by year and season. The water resources of Zarafshan, Chirchik, Surkhandarya, Kashkadarya and other rivers in our country are formed as a result of snow melting in the mountains and rainfall. The largest water consumption in the rivers, which are saturated as a result of melting snow and rain falls in the spring season. Glaciers are the main life source of Amudarya and Syrdarya rivers. These rivers use a lot of water in summer. The uneven distribution of river water throughout the seasons makes it difficult to use water resources. Water scarcity is particularly acute in the arid region, where most of the water resources go to irrigate crops. In order to alleviate the water shortage, a number of reservoirs and several large canals were built in the Aral Sea basin. These include the construction of the Toktagul reservoir (19.5 billion cubic meters), Andijan (1.75 billion cubic meters), Chorvok (2.0 billion cubic meters), Kairakkum (3.7 billion cubic meters) and other reservoirs in the Aral Sea basin. It helps to alleviate the water shortage that occurs during the vegetation period in the Republics located. "Katta Fergana", "Katta Andijan", "Katta Namangan", "Janubiy Mirzachol", "Parkent", "Tashkent" and other canals were built in order to use the rich fertile lands in the territory of our republic. Today, despite the fact that the canals and reservoirs built on the territory of our republic are engaged in supplying water to the agricultural, energy, industrial and national economy sectors, they are unable to fully supply the sectors with water. Therefore, the rapid development of industrial and agricultural production requires rational use of surface water resources and their redistribution.

Toktagul reservoir (19.5 billion cubic meters)

Andijan reservoir (1.75 billion cubic meters)

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Chorvok reservoir (2.0 billion cubic meters)

Kairakkum reservoir (3.7 billion cubic meters)

The main task of the water management complex is to develop regional recommendations for meeting the need for water in the face of the emerging shortage of water resources. It is carried out according to the single intersectoral scheme of rational use of water, which was created in order to distribute water in a reasonable manner in each of the sectors of the complex use of water resources in the region. Today, almost all large basins have water management schemes that characterize the state and prospects of water management development.

With the development of industry, the increase in the level of agricultural intensification, and the growth of the population, the consumption of fresh water is increasing every year. In 1950, the total water withdrawal for the country was 40 cubic km, in 1960 it was 50 cubic km, in 1970 it was 55 cubic km, in 1980 it was 57 cubic km, in 1985 it was 60 cubic km and in 2002 and it was 56 cubic km.

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Water consumption is increasing rapidly, it has increased 1.5 times in 50 years. The need for water will increase in the near future. [3,4,8,9,18,19]

Water supply means delivery of water to consumers. The development of regional productive forces, availability and location of labor resources is related to water supply. Water supply sets higher requirements for water quality than other types of water management complex. There are communal, industrial, agricultural and other types of water consumers. Each water consumer has its own characteristics. For example, the construction of houses requires a sharp increase in the capacity of water supply sources for co-municipal and water sports facilities. Currently, the communal household consumes more than 6% of the received water. [20,21]

Water is also widely used in industry. For example, an average of 350 cubic meters of water is used to produce 1 ton of steel. In iron alloy plants, water consumption is about 800 cubic meters per 1 ton of product. 1200 cubic meters of water are needed to produce 1 ton of silk, and 2500 cubic meters of water to produce 1 ton of kapron fiber. In 1998, 25% of the water received was used for industry.

The agricultural sector occupies a special place among all consumers of life in our country. It accounts for 50 cubic km of consumed water. Sectors of the water management complex make different demands on water resources. Water is a source of energy for the hydropower industry, a road for transportation, and a fish-breeding basin for fisheries. [5,6,7,10,11,16,17]

Integrated use of water resources increases the efficiency of water use. It also puts an end to the narrow departmental approach to water management activities. Their importance in the national economy is fully taken into account, and the requirements to protect water from pollution and exhaustion are certainly followed.

The result. A branch of the national economy, which includes a set of activities aimed at studying surface and underground water and using it for various purposes, is called water management. Water management sectors include:

1. Hydropower - use of moving water energy;

2. Water transport - the use of river, lake and sea water for shipping and logging purposes;

3. Melioration - using water for irrigation, with the intention of saving money;

4. Water supply and sewerage - providing water to the population and production enterprises; sewage;

5. Use of water resources - fish breeding, catching, salt extraction, etc.;

6. Protection of water bodies from pollution and degradation, erosion of the earth's surface from flooding and floods, erosion of shores. [12,13]

It should be noted that one water stream can be used for various purposes in the national economy. For example, the river is simultaneously used as a source of energy, waterway, irrigation and fish farming. It is not appropriate to build a separate section of water facilities for each purpose. [14,15] Therefore, it is permissible to use water sources comprehensively. It is necessary to take into account not only today's requirements, but also the multi-year plan for the development of this area in the design of the waterworks section. It is necessary to take into account the negative impact of water management activities on the part of the planned water facilities and reduce it to a minimum amount. Such negative effects include flooding of the river, deterioration of water quality (polluted industrial effluents, rotting of bushes and trees in flooded areas, etc.) flooding of agricultural fields and cities, creation of swamps, salinization of land, climate change, changing conditions for fish farming, etc.

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Discussion and Conclusions. Water supply and irrigation from water supply networks takes part of the water and spends it almost without returning it to the water source or returning it without sufficient purification. Therefore, they are water consumers.

Hydropower, water transport, fisheries are considered as water users in other sectors of water economy. They take water from a river or well and return it to the same place. Sometimes water can be diverted to another source. In other words, the planned water management activities should, by their nature, allow for the full use of the flow now or in the future, and the water users of the place where these activities are implemented, such as existing hydroelectric plants, irrigation water intakes or water supply, water intake facility and others must meet the requirements. [22,23]

There are water receiving, water blocking (dam), water storage (reservoir) and other types of hydraulic structures, which have different effects on the environment. Reservoirs are considered to be the most impacting on the environment among these structures, so the following should be taken into account during the design process:

1. The first stage of the construction of the reservoir is to search for a place for its basin and determine the calculation levels. Bathygraphic curves serve as the topographical description of the reservoir: the capacity curve W and the reservoir surface curve Ω, which is related to the reservoir level elevation-Z. From the point of view of efficient use of reserved land, the ratio W/Ω is exemplary, it can be considered as the average depth of the reservoir. The design is based not on the entire capacity of the reservoir, but on the useful capacity W_f, which is located between the water level of the unused volume and the NDS. The higher the W_f/Ω ratio, the better the description of the reservoir. For reservoirs located in the mountains, its value is equal to 8-11 and higher values, for reservoirs located in the plain it is 2-5.

2. Valley rivers are usually regional drains, therefore, the rise of the water level in the reservoir is the reason for the increase in the level of groundwater flow to the river, taking into account the additional moisture zone. This rise extends from the river to several and sometimes tens of kilometers (depending on the permeability of the soil and the level of the river). Forecasting the dynamics of additional water supply at the beginning of the water reservoir and in the flood zone where economic activity is limited or restricted should be an integral part of the project.

3. From an economic point of view, such an option is chosen, in which the total cost of construction and operation of the dam, NDS, operating mode, protective measures, etc., on the boundary of the reservoir, per unit product (1 cubic meter of useful capacity, 1 kWh of electricity etc.) ratio should be the smallest. It also ignores other aspects of efficiency and damage, such as navigation, improvement potential, water supply productivity, recreational and social effects, obstruction of fish migration and navigation, coastal impact on nearby cropland and forest areas and so on.

4. The composition of activities for the organization of the reservoir basin is as follows:

a) relocation of residential areas, roads, EUL, communication lines, historical monuments and objects from flooded zones and coastal strip damaged by waves as a result of the rise of underground aquifers and disposal of surface aquifers;

b) protection of some objects, including some agricultural land from flooding. In an approximate assessment, the flood zone is determined by the state of the ground water level under new conditions: if the depth of ground water is less than 4 m in residential areas, and less than 2 m in other places, such areas are said to be flooded.

c) sanitary measures (disinfection and relocation of places where infectious goods are buried, cemeteries, cleaning facilities, etc.; chlorination of the area);

d) preparation of a deep plot from the water reservoir for fish farming;

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e) archaeological work (identification, search and research of archeological objects that cannot be accessed);

f) taking anti-filtration measures in case of danger to objects located below (sometimes tens of kilometers away) as a result of filtration from the bottom and sides of the reservoir;

g) in necessary cases, to protect some sections of the water reservoir from storms caused by wind and core traffic, glaciers falling, high water levels, ice accumulation and blockage;

h) works against ground displacement;

i) measures to reduce the water level in the low-water zones protected from flooding of the reservoir;

j) works to adjust the sediment regime of the water reservoir;

k) measures against malaria;

l) special measures to correct the saturated biological regime due to changes in the speed and speed regimes of the flow in the reservoir;

m) environmental and nature protection activities.

The conduct of these events is clearly defined by regulatory documents.

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