Recommendations for the use of efficient water resources in mountainous areas and its economic-mathematical model

Xakimxon Xikmatov¹, Adkham Amonov¹*, Rakhmon Eshimov¹, Alisher Abdinobiyev¹, Ulugbek Ubaydollayev¹, and Jamshid Parmonov²

¹Samarkand branch of Tashkent State University of Economics, Samarkand, Uzbekistan
²Samarkand State University of Architecture and Construction, Samarqand, Uzbekistan

Abstract. Taking into account the global nature of this problem, creating modern methods and economic-mathematical models of the use of clean drinking water resources that are inefficiently used in winter and spring in the mountainous regions of the Republic of Uzbekistan, creating an artificial water basin by attracting foreign and national investors by advertising reasonable information about clean drinking water resources taken as the goal of the idea Garasha river area, to ensure the reawakening of nature around the basin, and to create conditions for the establishment of tourist zones in the recreation areas that are expected to be created by people. The next solution of the idea is the construction of model residences for the population living at the risk of floods, and the preliminary project of water supply has been developed with the support of our state and investors. Optimal use of water resources is increasingly recognized as a strategic issue for countries.

1 Introduction

Given the global problem, the goal of the idea was to attract investors through the promotion of water resources, based on the creation of methods and optimal economic-mathematical model of inefficient use of water resources.

More than 1,200 families around the Garasha River under study are at risk of severe flooding, and since May, due to water shortages, the crops grown for their farms will die before they are ripe, and the costs incurred will not be reimbursed. As a result of the research, the first solution is to propose methods of building an artificial water basin in the area, to create an artificial water basin in accordance with Figure 2, to awaken nature around the basin, to create tourist zones in man-made recreation areas. As another solution to the idea, with the support of the state and investors, a method of water supply for the construction of modern housing for people living at risk of floods has been developed (Figure 4).

In Uzbekistan, as in the rest of the world, the problem of water scarcity has become one of the most pressing issues. Optimal use of water resources is increasingly recognized as a strategic challenge for countries [1].

* Corresponding author: adkham1972@gmail.com

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While this problem is one of the global problems of world scientists, it cannot be said that they know in which region water resources are wasted inefficiently, the reasons for it, why these cases are not prevented, whether it can be prevented or not. Given that these cases are more prevalent in most mountainous areas, the aim was to try to solve the problem by formulating this theme as follows and attracting investors by advertising the water resource in the foothills of the Nurato mountain range we are studying.

2 Theoretical background

The Garasha River, which we are studying, starts from the Nurato mountain range and flows into the Tosinsoy reservoir. More than 1,200 farms around the Garasha River have been experiencing water shortages since May, their crops are dying before they are ripe, their expected incomes are not being met, and indigenous people are not trying to grow what they need to grow. an environment based on growth is formed spontaneously. Unemployment among the population, the formation of the poor class will increase, the demand for agricultural products will increase, the price of products will rise, the shortage will increase.

One of the main solutions to this problem is the creation of artificial reservoirs in the Garasha river basin, if the local population can create water reserves to irrigate crops in May and July, the population living around the Garasha river will not have to buy farm products, the population will be employed. contributes to the supply of markets with.

3 Results and discussion

After studying the above problems, the idea was to propose a methodological, economic and mathematical model for the creation of an artificial water basin from the source of the Garasha River, which is harmless to nature, the most convenient, with a land reserve around it, from the created water resources.

Based on the opinion of Luis A., a leading scientist in the field, “When there is not enough water in a reservoir, it is better to control floods” [2], we try to create a small water basin. It is planned to block the river from the blue line in Figure 1. From the local stones in the form of a trapezoid 3-4 meters in width of the barrier, in the local method of stone picking, the water leakage rate is minimized, taking into account the fact that without other additives, the water after the pool is filled will pass over the barrier. The average depth of the river is 10 m, the length is covered 5 thousand m.

![Fig. 1. A convenient place for a dam to be built.](image-url)
Rain, snow, and spring water were obtained as water suppliers to the artificial small water basin.

- $D_i$ – water collected from rain during $i = 1.6$ months;
- $S_i$ – water collected from rain during $i = 1.6$ months;
- $R_i$ – water collected from springs $i = 1.12$ months;
- $x_i$ – storage capacity;
- $Q$ – MAX water capacity in the warehouse;
- $P$ – the volume of water that flows spontaneously after the reservoir is filled;
- $H$ – expected benefit;
- $T$ – the cost of the dam, which will be built in a convenient location on the river.
- $R$ – net profit.

Mathematically:

\[
Z_{max} = \sum_{i=1}^{k} C_i x_i
\]

\[
\sum_{i=1}^{k} \sum_{i=1}^{k_1} \sum_{i=1}^{k_2} (D_i + S_i + R_i) \leq Q - P
\]

\[
D_i \geq 0, S_i \geq 0, R_i \geq 0
\]

\[
x_i = D_i + S_i + R_i
\]

$C_i$ – the cost of one unit of water,

$C_i x_i \leq H$

Resources for dam construction:
- $KA$ – volume stone,
- $PS$ – unit workforce,
- $TE$ – technical costs,
- $RD$ – the cost of building a dam.

RD = KA*PS*TE

Calculation through the parameters of the created water basin: $l=1250$ unity.
- $h= 8$ unity.
- $k =24$ unity.
- $V = 240$ unity.

\[
R=H-RD
\]

$C_i *240 \text{ unity} \geq R$

When the above is done, the profit is expected to be in R units.

On the other hand, the solution of the idea is quickly and naturally around the artificial basin, and as a result of the movement of the population, positive ecological revival begins to create a climate conducive to the creation of recreation areas in the area. The natural flora and fauna of the surrounding water resources are restored, and fruit and ornamental trees and fields are created on the basis of the plan.

The use of water in the basin creates the basis for the development of a variety of raw material resources, the natural resources that have long existed, the production of building materials, the processing of wild and cultivated trees. The awakening of nature in the foothills,
the emergence of natural recreation areas requires the creation of tourist zones, the effective use of favorable conditions created and created on the basis of our ideas, the use of raw materials, recreation, leisure and recreation. is the basis.

Fig. 3. Facilities that are expected to be built after the construction of the dam.

In the future, the construction of modern housing for the population, which is currently at risk of floods, will improve the living standards of the urban population by building recreation centers, employees, employees of manufacturing enterprises, which will be created with the help of investors.

4 Recommendations and solutions

To solve this problem, select sites suitable for the construction of model houses from the hills near the water basin (the hill on the right, the project on the left), as shown in Figure 4. , the issue of uninterrupted water supply to the population using the water of the basin will be addressed as one of the next issues of the idea.

Fig. 4. Model houses to be built and their water supply.

A drought is beginning in Central Asia, which will inevitably lead to a shortage of drinking and irrigation water, a decrease in fodder and pulse crops, a decrease in productivity, and a shortage of electricity.
According to experts, the volume of water per person in Uzbekistan has decreased by 48% over the last 15 years - from 3048 cubic meters in 2008 to 1589 cubic meters by the end of 2022.

According to his data, the countries of Central Asia are among the ten largest water consumers in the world, corresponding to the indicator of Uzbekistan (2295 m³/year).

In addition, until now in the Central Asian countries, 2.5-3 times more water is used to grow a unit of product than in developed countries.

The region has been experiencing extreme heat for several years in a row. This situation seriously affects the socio-economic situation and endangers the food security of the Republic.

This situation is aggravated by "chronic diseases" related to the deterioration of the water supply infrastructure of the region.

The peculiarity of water use in the Central Asian region is that the rivers of the region flow through several countries, which creates problems between the interests of the countries located upstream and the interests of the republics located downstream.

These problems especially affect the accumulation of water reserves in reservoirs in spring and summer for efficient production of electricity in winter. In addition, this problem increases the number of consumers who need agricultural water.

In order to eliminate these problems, multilateral negotiations on the effective regulation of the water and energy complex and cross-border cooperation have been ongoing since 1992. However, draft agreements on this issue are still ongoing.

Water wasters in the world According to the Food and Agriculture Organization of the United Nations, the Central Asian countries have enough water reserves per capita (about 2.3 thousand m³), but the main problem is not a lack of water, but the wrong It is clearly visible that it is in use.

After the independence of Uzbekistan, during the agricultural reform period, the land was leased for 50 years, but the irrigation system in the fields was left aside.

In order to eliminate these shortcomings, the project of establishing a specialized center for digitalization of water management and analysis of irrigation facilities under the leadership of the head of state in recent years was launched, and the problematic issues continue to be solved one after another.

Based on the opinion of most experts in the study of the raised issues, the lack of water resources in Central Asia is a myth, there is enough water for everyone, it is only necessary to manage it wisely, aiming to solve this issue raised by us. received.

5 Conclusion

If the 1,200 families affected by the floods are provided with adequate water and shelter, their lifestyles will change dramatically, and the construction of enterprises in the region will provide jobs for the mountainous people, inspired by the current state policy. lives, serves the people, the society, the state accordingly.

If the expected artificial water reservoir is created, the issue of bringing industry to the village will be solved, that is, small enterprises that will process agricultural products grown on the acquired land, work on natural stone, and raise duck and goose poultry will be established.

Currently, if the places in Figure 4 around the Garasha stream are provided with continuous water supply, recreation areas, tourist zones, and home hotels will be created in these places.

The next element of the problem solution is the quality of the houses for the people living in the areas with high risk of floods during the spring rains.
References