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Assessment and Solution Paths for Water Resource Problems in the Navoi Region

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The article describes the state, distribution, and analysis of water resources in the Navoi region, broken down by districts. Based on the identified problems, the author provides proposals for addressing the water resource shortages in this industrial region and mitigating water scarcity.

Keywords: Production infrastructure, hydro energy resources, Zarafshan River, Amu-Bukhara Canal, groundwater, laser land leveling, agro-technical measures, information and communication technologies, digital economy.

1. Introduction

As we know, on December 29, 2020, the President of Uzbekistan Shavkat Mirziyoyev, in his Address to Parliament, proposed the establishment of a Regional Infrastructure Development Fund in 2021 with a budget of 3 trillion UZS. As the Head of State reported, these funds will be used to finance infrastructure projects proposed by local. 100 techno parks, small industrial zones, regional clusters, and logistics centers will be created in 84 districts and cities. 1.6 trillion UZS will be allocated to create infrastructure in free economic and small industrial zones [1]. In the author's opinion, the creation and development of infrastructure adequate to the market is currently one of the important conditions for the transformation of economic relations in Uzbekistan. The effectiveness of economic reform largely depends on the level of infrastructure development.

The term "Infrastructure" is generally understood as a complex of production and non-production industries that provide conditions for reproduction [2]. It is important to note that production infrastructure, being one type of infrastructure, consists of industries that provide external conditions for direct production processes. Services are the process and outcome of production infrastructure, forming "general conditions" for the reproduction process.

It is important to remember that production infrastructure is not production itself; it is elements necessary for full-fledged production, the organization of the production process. The question arises, what constitutes production infrastructure? As mentioned above, production infrastructure includes auxiliary elements, which we can attribute to: freight transport,

wholesale trade, electricity, gas, water supply, warehousing, communications, and information services. This article will focus on water supply.

Central Asia was examined in the work of L.Yu. Gusev, "Water and Energy Problems of Central Asia and Possible Ways to Solve Them." It states that problems in this area began back in the 1930s [4]. The current problems of the water sector in Uzbekistan are presented in a book published by the Ministry of Water Resources of the Republic of Uzbekistan dedicated to the 70th anniversary of the International Commission on Irrigation and Drainage, "Irrigation and Drainage in the Republic of Uzbekistan: History and Current State" [5].

During the study, to determine the number of industrial enterprises operating in the Navoi region by district, the following data were used: the Statistics Department of the Navoi region, for analysis of water savings calculations in the districts of the Navoi region, and for drawing a diagram.

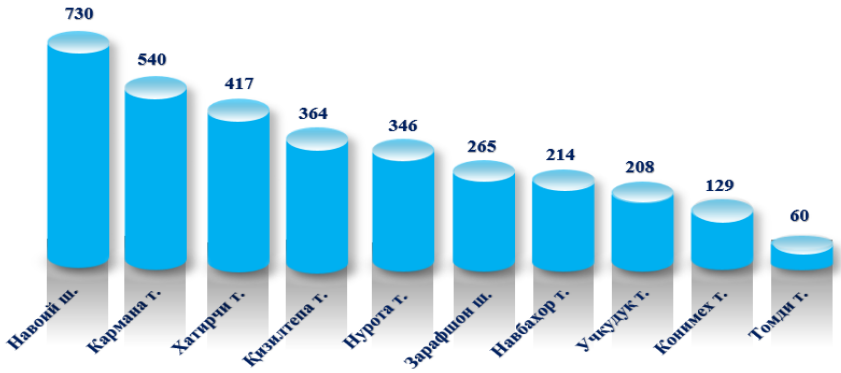


Figure 1. Number of Operating Industrial Enterprises in the Navoi Region (as of January 1, 2021).

The distribution of water resources of the Zeravshan River in the Navoi region, the development of a visual diagram of the planned water savings in the Navoi region in 2021 by district, used data from the "KarmanaKonimekh" Irrigation System Management in the Navoi region.

According to the water stress ranking of countries published by the World Resources Institute, Uzbekistan ranks 25th out of 164 countries [3]. As we understand, this indicates a shortage of water suitable for drinking and household needs of the population.

As we know, water scarcity is a very pressing problem for Uzbekistan, as its shortage in a number of regions of Uzbekistan could lead to a social and environmental crisis. Already today, there is a shortage of water not only for agricultural purposes, but also for household needs of the population.

Hydropower resources in Uzbekistan account for only 4.92% of the country's total area, with total water resources amounting to 50–60 km3 per year, of which only 12.2 km3 are formed within the republic [4], due to renewable surface and groundwater of natural origin, as well as return waters of anthropogenic origin. Water resources are mainly formed in transboundary river basins. As for agriculture, due to the arid climate, the country's agricultural production is

almost entirely dependent on irrigation, and only about 752,900 hectares (18%) of arable land are rain-fed (not irrigated).

The current annual water demand of all sectors of the economy is about 64.2 km3 (see Table 1 below). In the future, the water demand for drinking water supply, industry, and rural areas will increase, while it will decrease in irrigated agriculture due to water-saving technologies and measures to increase fertility. By 2030, the total water requirement for Uzbekistan should not exceed 60.1 km3 per year. It should be noted that the population of the republic has increased from 15 million people in 1980 to over 34.5 million people as of January 1, 2021 [5]. As the population grows, so does the overall water demand.

Table 1. Comparative Table of Water Consumption (Demand) by Economic Sectors of Uzbekistan. 2018 and Outlook (million m per year)

Water consumers (by priority) surface water resources	Total required volume of water	Including by sources		
		Surface water resources	Underground water resources	Return waters
2018 y.				
Public utilities	5320	2200	3120	0
Industry	1885	855	1030	0
Agricultural water supply	485	415	70	0
Fisheries	640	460	0	180
Energy industry	770	770	0	0
Irrigated agriculture	55100	50000	1100	4000
Total	64200	54700	5320	4180
2030 y				
Public utilities	6200	2450	3750	0
Industry	3500	1580	1920	0
Agricultural water supply	950	810	140	0
Fisheries	640	460	0	180
Energy industry	780	780	0	0
Irrigated agriculture	48000	46800	700	500
Total	60070	52880	6510	680

Source: Comprehensive Water Resources Utilization Scheme of the Republic of Uzbekistan until 2027. Summary Explanatory Note. "Vodoproekt" Association of the Ministry of Water Resources of the Republic of Uzbekistan. Tashkent. 2017. 169 pp.

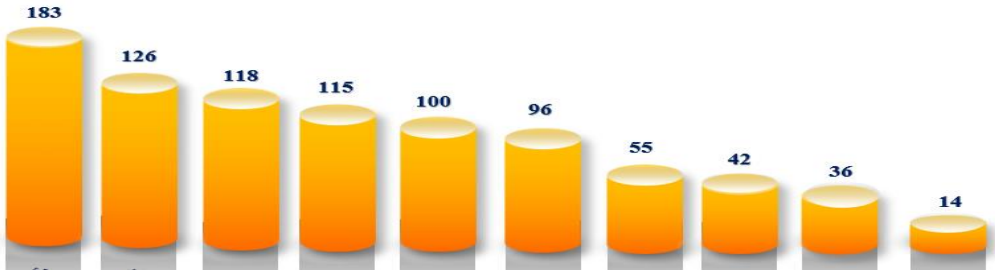
According to the Decree of the President of the Republic of Uzbekistan issued in April 2020 "On Approval of the Concept for the Development of Water Resources of the Republic of Uzbekistan for 2020-2030", "Priority areas for the implementation of the Concept are the sustainable and guaranteed provision of water for all sectors of the economy, in the medium and long-term perspective, as well as the effective and rational use of water. Increasing their

quality and safety through the widespread introduction of integrated management of all surface, groundwater, and return waters" [6].

In the author's opinion, in order to begin solving the problem of water scarcity, as well as implementing the Water Resources Development Concept, it is necessary to use deductive and inductive methods within the country, i.e., methods of reasoning from the general to the specific and vice versa, specifically at the level of each region. By improving the state of water resources in the regions, we can thus solve this problem in the country.

The region consists of 8 rural districts (Kanimekh, Kyzyl tepa, Navbakhor, Navoi, Nurata, Tamdy, Uchkuduk, Khatyrchi), 6 cities (Zarafshan, Karmana, Kyzyltepa, Navoi, Nurata, Uchkuduk), 8 urban-type settlements (Gazgan, Kanimekh, Langar, Malikrabot, Muruntau, Tinchlik, Shalkar, Yangirabat), and 53 villages.

As of January 1, 2021, the permanent population of the Navoi region reached 1,013.8 thousand people[7].



Both the population and industrial enterprises are consumers of water resources. The following can be considered as sources of water resources in the Navoi region:

1. Zeravshan River

2. Amu-Bukhara Canal

3. Groundwater

The Zarafshan River is the primary source of water resources in the Navoi region.

The Ministry of Water Resources of the Republic of Uzbekistan conducted a study that revealed the total water storage capacity in reservoirs across Uzbekistan is 10 billion cubic meters, which is 2.3 billion cubic meters less than in 2020 and 1.5 billion cubic meters less than the average volume over many years. According to preliminary estimates (as of February 2021), a significant reduction in water flow compared to the norm has been recorded. In most rivers of Uzbekistan: in the rivers of the southern Ferghana Valley - this is 90-100 percent, in the Vakhsh, Zarafshan - 85-95 percent, in the Surkhandarya and Naryn - 80-90 percent, in the Kashkadarya - 75-85 percent, in the Karadarya, Chirchik, and Akhangaran - 70-75 percent, in the rivers of the northern Ferghana Valley - 60-70 percent [8]. As we can see, the Zeravshan River (with an indicator of 85-95%) ranks second after the Ferghana Valley in terms of the level of water flow reduction.

Based on the presented data, considering the significant reduction in water flow compared to the norm in the Zarafshan River, in order to provide the districts of the Navoi region with the necessary amount of water resources and to mitigate the water deficit, it is necessary to take measures to conserve existing water reserves, introduce technologies, and carry out appropriate activities. Among the previously completed irrigation works in our region, we can mention the introduction of new integrated irrigation construction methods.

Currently, work is also underway in the Navoi region on the rational use and reduction of water consumption. Specifically, water-saving technologies have been introduced in the districts, laser land leveling is regularly carried out, repair and restoration activities have been carried out in irrigation sectors, information and communication and digital technologies have been introduced, and additional agrotechnical measures have been taken in sown areas. The measures taken, the introduction of technologies, the work done, and the events held have led to significant water savings and a reduction in the volume of water consumed by the districts. The indicators of water savings in the Navoi region are presented below:

According to the diagram, we see a noticeable difference in water consumption before and (forecast) in 2021 after taking measures to save water. In total, in the Navoi region, during the course of water conservation, water consumption was reduced by 408 million m3, i.e., by 27%. Overall, this is a good result. To this end, it is worth considering...

Each district. Thus, as can be seen from the diagram above, in terms of the volume of planned water savings in 2021, the leading positions are occupied by Kyzyltepa district (141 million m3) and Khatyrchi district (105 million m3), with average indicators for Karmana district (76.2 million m3) and Navbakhor district (63 million m3). The lowest forecast figures are for Kanimekh district (12 million m3) and Nurata district (11 million m3). It is also necessary to take into account that the water demand in Kanimekh and Nurata districts is lower than in other districts. Consequently, in districts with high water consumption, the measures taken to save water are not sufficient, for this reason, it is necessary to find ways to save and rationally use water resources in certain districts.

To ensure that the districts of the Navoi region have the necessary amount of water and to mitigate the deficit, the author proposes the following ways to solve the problem of water scarcity:

1. Increasing the sowing of water-intensive crops and growing rice using intensive methods.

2. Intelligent water resource management systems, introducing "Smart Water" technology and similar digital technologies into water use.

3. Paying close attention to studying the technical condition of water management facilities using drones, digitization, and improving the quality of design and survey work.

4. Using and applying the innovative mobile application "TOMCHI," for water conservation, productivity enhancement, and rational use of irrigation water, developed within the framework of the National Water Management Project in Uzbekistan, funded by the Swiss Agency for Development and Cooperation and implemented in partnership with the Ministry of Water Resources of the Republic of Uzbekistan.

5. Attracting foreign investors to this sphere.

6. Regular repair of water lifting facilities, i.e., pumping stations and pumping units that supply water to cleaning, storage, or consumption sites.

7. Increasing the number of towers and reservoirs that play a role in regulating and spare capacities in the water supply system.

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