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Water Supply Problems in The Northern Regions of Karakalpak Stan And Their Solutions

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Abstract: The northern districts of Karakalpakstan, particularly Chimbay and Karauzak, face severe challenges in water supply due to the combined effects of ecological degradation, climate change, inefficient infrastructure, and socio-economic pressures. As a result, these difficulties directly affect public health, agricultural productivity, and social stability. In this paper, the main causes of water scarcity in these districts are analyzed, the consequences are explored in detail, and possible solutions are discussed with reference to recent infrastructure projects and international cooperation. Importantly, concrete examples drawn from UNDP, UNFPA, and NGO initiatives illustrate how sustainable water management strategies can alleviate the crisis.

Keywords: Karakalpakstan, Chimbay, Karauzak, water supply, scarcity, infrastructure, ecology, solutions.

Introduction: Water is universally recognized as a vital resource for human survival, economic growth, and environmental stability. In arid and semi-arid regions, however, water scarcity presents a significant obstacle to development. According to the United Nations, by 2050 nearly half of the global population may live in areas under severe water stress. Central Asia is already on the frontline of this crisis due to its dependence on river-fed irrigation and vulnerability to ecological change [5].

Within Uzbekistan, Karakalpakstan is considered one of the most water-stressed regions. While the desiccation of the Aral Sea has attracted global attention, its most devastating consequences are felt locally, particularly in Chimbay and Karauzak districts. These territories were once sustained by the Amu Darya delta, but now face acute shortages of safe drinking water. Consequently, it is necessary not only to identify the causes of these shortages but also to understand their wider implications and to explore viable, long-term solutions.

First and foremost, the water crisis in Chimbay and Karauzak is a direct legacy of the Aral Sea's decline. In the 1960s, large-scale diversion of the Amu Darya and Syr Darya rivers for cotton monoculture dramatically reduced inflows into the Aral Sea. As the sea receded, the surrounding water table fell, salinity levels rose, and fertile deltaic systems collapsed. As a result, villages in Chimbay and Karauzak that once relied on natural distributaries now struggle to access fresh water. For example, many canals in Chimbay dried out completely by the early 2000s, leaving residents dependent on trucked water or saline wells.

In addition, climate change has intensified the water scarcity. Research by the Uzbekistan Hydrometeorological Service shows that the average annual temperature in Karakalpakstan has increased by nearly 1.5°C over the past five decades. Consequently, evaporation from open canals and reservoirs has risen, while precipitation has become more irregular. During drought years such as 2018 and 2021, residents of Karauzak reported that even shallow wells dried up temporarily, forcing households to queue for emergency deliveries. Thus, climate variability compounds the structural problems inherited from the Aral Sea crisis.

Moreover, inefficient irrigation practices continue to drain the limited water supply. Approximately 80% of

the water resources in Karakalpakstan are used for agriculture, particularly cotton and rice. However, the majority of irrigation canals are unlined and leaky. In Chimbay, farmers often complain that summer irrigation water fails to reach their lands, forcing them either to purchase expensive trucked water or to abandon part of their crops.

Finally, the drinking water infrastructure in Chimbay and Karauzak is extremely outdated. In many villages, pipelines have not been replaced since the Soviet era. As a result, leakage rates are high, and delivery is unreliable. For instance, in several Chimbay villages, water is delivered by tractor tanks only two or three times a week. Not only is this insufficient for household needs, but it also raises costs, since families must pay for each delivery. Furthermore, the poor quality of water delivered—often containing excessive salts and nitrates—makes the situation even more problematic [7, 259-274].

Because of these water supply difficulties, residents of Chimbay and Karauzak face serious health problems. According to WHO and local health authorities, drinking water in northern Karakalpakstan often contains high levels of salinity, nitrates, and heavy metals. Consequently, kidney diseases, gastrointestinal disorders, and anemia are widespread. For example, medical surveys in Karauzak show that anemia rates among children are well above the national average, largely due to chronic exposure to poor-quality water and poor nutrition linked to declining agricultural yields.

In addition, agriculture—the backbone of the local economy—suffers greatly. As water becomes scarcer, crop yields fall, and salinization worsens soil conditions. For instance, wheat yields in Chimbay have declined by almost 30% over the past decade, pushing farmers toward alternative crops such as melons, which require less water. However, such shifts are not always profitable, and many farmers remain trapped in cycles of low productivity and debt.

Moreover, the lack of reliable water supply contributes to poverty and migration. Many young people leave Chimbay and Karauzak to seek employment in Nukus, Tashkent, or Kazakhstan. This depopulation weakens rural communities and undermines local economic resilience. At the same time, women and children often bear the burden of fetching water, which reduces time available for education and income-generating activities. Thus, the crisis is not only environmental but also deeply social.

To begin with, the modernization of water infrastructure is essential. The UNDP–UNFPA Joint Programme, supported by the Government of Japan, has reconstructed water treatment facilities in Chimbay and Karauzak. For example, in Chimbay, a facility with desalination capacity of 8 m^3 per hour was installed, along with nearly 5 km of new pipelines, bringing clean water to 68 households in Bakhytly. In addition, a 10.6 km network was laid to connect over 650 residents in Zhanamakan and Gujimli villages. Likewise, in Karauzak, a new water treatment plant launched in 2022 now provides clean water to hundreds of households.

In parallel, alternative livelihoods are being promoted to reduce dependency on water-intensive crops. For instance, beekeeping projects in Karauzak, supported by UNDP, have given farmers new income sources with minimal water demand. Cold storage facilities, introduced in both Chimbay and Karauzak, enable farmers to preserve melons, vegetables, and fish, thus stabilizing income and reducing losses. These innovations help households cope with water shortages more effectively.

Furthermore, educational campaigns have been launched to encourage water-saving practices. NGOs in Chimbay have trained farmers to monitor soil moisture and adopt drip irrigation. School-based WASH (Water, Sanitation, and Hygiene) programs in Karauzak have improved awareness among children and families, fostering a culture of careful water use.

In addition, since the Amu Darya is a transboundary river, regional cooperation is vital. Agreements with Turkmenistan and Tajikistan on water distribution must ensure fair access for Karakalpakstan. International partners such as the Asian Development Bank and the International Chodiev Foundation have also contributed by funding infrastructure upgrades. For example, by the end of 2023, the ICF installed modern water supply systems in Karauzak villages, benefitting over 1,700 residents.

Conclusion

In conclusion, the water supply problems in Chimbay and Karauzak are the outcome of intertwined ecological, climatic, and infrastructural challenges. The desiccation of the Aral Sea, combined with rising temperatures, outdated irrigation, and crumbling pipelines, has left these districts in crisis. As a result, health issues, agricultural decline, and social instability continue to threaten community resilience. Nevertheless, recent interventions demonstrate that progress is possible. The reconstruction of treatment facilities, installation of desalination equipment, extension of water networks, and support for alternative livelihoods offer tangible hope. Furthermore, international partnerships and local education campaigns illustrate that sustainable

solutions must integrate technical, social, and economic dimensions. Ultimately, solving the water supply crisis in Chimbay and Karauzak will require sustained political will, regional cooperation, and community participation. If these efforts are coordinated effectively, the northern regions of Karakalpakstan can move toward a more secure and sustainable water future.

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