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PAPER

IRRIGATION STRUCTURES CONSTRUCTED ON THE LEFT AND RIGHT BANKS OF THE AMU DARYA RIVER

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Abstract

This article explores the history and structure of irrigation facilities built along the left and right banks of the Amu Darya River. It focuses on ancient canals, ditches, dams, and other hydraulic structures identified through archaeological research. The study highlights the role of these systems in agricultural development and their significance for ancient civilizations such as Khorezm and Bactria.

Key words: Amu Darya, irrigation system, ancient hydraulic structures, left bank, right bank, Khorezm, Bactria, archaeological findings.

Introduction

Amu Darya, one of the largest rivers in Central Asia, has long played a pivotal role in shaping the agrarian culture and economic activities of the peoples residing along its banks. Since ancient times, inhabitants of both the left and right banks have constructed various irrigation structures—canals, ditches, dams, and reservoirs—that served as the foundation for sustainable agriculture in the region's arid climate. These hydraulic complexes ensured the vital distribution of water among settlements and irrigated lands, which, in turn, facilitated the development of civilizations such as Khorezm and Bactria[11].

Archaeological research in recent decades has revealed numerous traces of irrigation systems on both the left and right banks of the Amu Darya. Particularly significant are the findings in the area of the ancient Khorezmian delta, where remnants of complex canal and reservoir systems, dating back to the 1st millennium BCE, have been uncovered[12]. In addition to material remains, written sources, such as the works of Aristobulus, Ptolemy, and Arab geographers, provide valuable information about the structure and scale of ancient irrigation systems[2].

This article is dedicated to the analysis of the types of irrigation structures, their geographical distribution, and their impact on the socio-economic development of ancient communities in the region[4].

Literature Review

The study of ancient irrigation systems in the Amu Darya basin encompasses a wide range of interdisciplinary research, including archaeology, history, and hydraulic engineering. The works of Yu.A. Zhuravsky examine the engineering principles behind the operation of ancient canals and their role in sustainable irrigation of agricultural lands in the region[1]. L.M. Alisher's studies expand the understanding of the socio-economic significance of water systems in Khorezm, emphasizing their multi-tiered structure[2].

I.R. Shishkin's monograph provides an in-depth analysis of archaeological expeditions in the Amu Darya valley, including the mapping and dating of hydraulic structures[3]. Additionally, T. Khodjaev explores irrigation in the context of the region's economic development during the ancient and early medieval periods, drawing on both written and material sources[4].

Research Methodology

To analyze the irrigation structures located on both banks of the Amu Darya, this study employs a historical-reconstructive method, combining data from archaeological excavations and topographic surveys[3]. Stratigraphic analysis is actively used to date the stages of construction and operation of hydraulic structures[7].

Additionally, spatial analysis methods based on satellite imagery and archival maps are applied, enabling the localization

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of ancient riverbeds and canals that have since disappeared or been overlaid by modern structures[9]. This comprehensive approach ensures the reliability of the irrigation system's reconstruction and provides insight into its evolution within the context of the region's socio-economic development.

Analysis and Results. The irrigation system of the Amu Darya valley demonstrates a high degree of engineering sophistication, developed amidst a complex natural and social landscape. According to S.P. Tolstov, a complex network of canals operated in the delta of ancient Khorezm, encompassing both large main arteries and local distribution sections that ensured water supply to agricultural lands[5].

M.I. Gulyamov distinguished two types of irrigation in Khorezm: natural-gravitational and artificially regulated. He noted that the left bank of the Amu Darya was better suited for stable agriculture, while the right-bank structures were characterized by seasonality and adaptability[6].

B.V. Andrianov, utilizing remote sensing and geoinformatics, mapped dozens of ancient canals, many of which align with modern irrigation structures. His research confirms the continuity of water management practices and their influence on the placement of ancient settlements[1].

Thus, the analysis reveals that the region's irrigation structures evolved dynamically, reflecting not only environmental realities but also the socio-economic priorities of their time.

Conclusion and Recommendations

The study confirms that the irrigation structures on both banks of the Amu Darya are the result of highly advanced engineering and organizational efforts by ancient Central Asian communities. These structures not only provided vital water supply but also shaped the economic, social, and cultural framework of ancient Khorezm.

According to Ya. Gulyamov's findings, irrigation systems played a decisive role in the formation of sedentary agrarian societies. He emphasized that a stable canal system ensured not only crop yields but also security, enabling populations to live in sustainable settlements[7].

M.E. Masson, referencing numerous archaeological discoveries, noted that many irrigation structures were built according to a unified engineering principle, often incorporating a complex network of watersheds, sluices, and diversion canals. He also highlighted a close connection between irrigation and the development of ancient cities in the region[8].

S.P. Tolstov, in his fundamental works, demonstrated that Khorezm's ancient hydraulic systems were unique in scale and resilience. Particularly significant is his observation that these systems often functioned for centuries without major reconstructions, indicating a profound understanding of natural conditions and hydrology[10].

Thus, the Amu Darya's ancient irrigation infrastructure represents not only a monument of engineering ingenuity but also a social institution that fostered regional stability and cultural continuity.

Recommendations:

1. Organize digital archiving and 3D modeling of ancient irrigation systems using modern GIS technologies. 2. Incorporate the study of ancient irrigation into school and university curricula on the history and ecology of Central Asia. 3. Establish regional open-air museums showcasing restored sections of ancient canals, sluices, and dams, accompanied by explanatory materials.

Foydalanilgan adabiyotlar ro‘yxati

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