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The Significance of Sardobas on the Great Silk Road

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Abstract: This article deeply analyzes the historical, economic, social, and architectural significance of the Central Asian sardobas (water reservoirs/cisterns) located along the Great Silk Road (GSR). Since the GSR was the main artery of trade, culture, and inter-civilizational dialogue, securing water supply in desert and semi-desert conditions played a crucial role in the continuous movement of caravans and the stability of trade activities. Sardobas were not just hydro-technical structures but also served as rest stops for caravans, defense points, and a source of life for surrounding settlements. The research examines the water storage technology, placement of the sardobas, and their contribution to the sustainable development of the GSR, based on medieval sources, archaeological data, and existing scientific literature.

Keywords: The Silk Road, Sardoba, Water Structures (or Hydro-structures), Caravanserai, Hydro-engineering (or Hydrotechnics), Central Asia, Trade Routes, Water Supply.

Introduction. The Great Silk Road (GSR) was a vast trade and cultural system connecting the East and the West from the 2nd century BC until the opening of new maritime routes. This transcontinental route passed through the arid and wide desert regions of Central Asia. In such harsh conditions, especially for long-distance caravan trade, security and water supply were among the main problems. While caravanserais (rabats) were a crucial part of this road infrastructure, one of the key elements ensuring their habitability was the sardobas.

Sardobas (from the Persian-Tajik "sard" - cold, and "ob" - water) are ancient hydro-technical structures: domed reservoirs built underground or semi-underground, designed to keep water clean and cool throughout the year. The purpose of this article is to analyze the unique role of sardobas in organizing water supply along the GSR, to demonstrate their architectural features, and their impact on the civilization of the region.

Literature Review on the Subject. Direct research dedicated to sardobas is reflected in the works of **G. A. Pugachenkova** and **L. I. Rempel**, which focus on the study of architectural monuments. These authors have thoroughly described the architectural structure of sardobas, particularly their cylindrical shape, thick domes, and the entrance stairs designed for drawing water. Furthermore, the works of contemporary researchers such as **R. Kh. Suleymanov** analyze the exact location of these structures, their strategic distances along the caravan routes (typically at a one-day journey interval), and their functional connection with the surrounding caravanserais, using the example of large surviving sardobas in the territories of Samarkand, Bukhara, and Qarshi steppes (e.g., Raboti Malik Sardoba, Qorovulbozor Sardoba).

Research Methodology. The article aims to study the significance of sardobas on the Silk Road based on a complex and systematic approach. The main objective is to determine the crucial role of sardobas in ensuring the continuity of caravan trade in arid regions, through the analysis of historical and architectural data. Theoretical analysis and observation methods were utilized as the research methodology.

Analysis and Results. The Silk Road was considered an important international transit route for the development of strategic communication and trade between states and cities. Architectural objects were built in every state and city along the Silk Road to create comfort for merchants. We can mention some of these architectural objects, which consist of caravanserais, rabats, and sardobas. In terms of construction, sardobas have a diameter of up to 16 meters, a depth of 10–15 meters, and wall thickness reaching 1.5 meters. Researchers suggest that two types of sardoba construction developed in Central Asia:

Sardobas covered with a dome;

Unfinished or open-top sardobas;

The standard construction material for registered sardobas in Uzbekistan is typically flat, square baked brick of various sizes; stone is rarely used for foundations. However, the aforementioned baked bricks are found among the ruins of ancient cities in Central Asia [1].

In this regard, **Mukhtor Pardayev**, Deputy Director of the Institute of Archaeological Research of the Academy of Sciences of Uzbekistan and head of the Jizzakh archaeological expedition, states: — The Great Silk Road was also very important for the Jizzakh oasis. The caravan route that started from Baghdad, the capital of the Arab Caliphate in the 9th–11th centuries, was extremely busy during this period, passing through the Iranian cities of Basra, Kashan, and Ray to Merv, the capital of Khorasan. From there, it crossed at the Amul city (Chardjou) on the left bank of the Amu Darya. It reached Paykent, the city of Turkic merchants in the Bukhara oasis. The next major stop was Samarkand, a city of artisans and a trade center, and after that, it came to Jizzakh. Jizzakh's economic and military-strategic importance on the Great Silk Road was that after this city, caravans entered an area covered with deserts. It is exactly after Jizzakh that the caravan route splits into three.

The first route went Jizzakh – Ravot – Zomin – Sabot – Shahriston (Uratepa) – across the Asht steppe to the Fergana Valley, and then through Osh to China. The second route went Jizzakh – Qaratepa (Dashtobod) – Khovos – Khujand – Fergana Valley and connected again through Osh to China. The third route was shorter and closer but crossed the Mirzachol with less drinking water: Jizzakh – Sardoba – Mirzarabot – Yakkasardoba – Syr Darya crossing, Tashkent oasis, and through Jetisu – Turfan to China [2].

Sardobas do not differ much from each other in terms of architectural structure. These sardobas, built in the form of a circular reservoir covered by a dome, have several windows in the dome, special holes underneath them for water to flow in, and a circular skylight at the top. Additionally, there is a special entrance designed for drawing water from the sardoba reservoir. To keep the water cool, the windows and the door were designed to allow constant air circulation. Skylights were placed on the East (Sunrise) and West (Sunset) sides to let light in and maintain a constant temperature inside the sardoba. The lower door of the sardoba was constructed facing away from the wind direction. A gutter (tarnov) was built for water to enter the reservoir. A caravanserai was located near the sardoba, where travelers rested and stocked up on water for the long journey. All sardobas were mainly filled with rainwater and melted snow. Such water flowed into the sardoba reservoir through special small canals. In some sardobas, water was also brought from rivers and other water sources through special channels. The windows in the sardoba dome and the skylight at the top play a major role in preventing water contamination and ensuring air circulation within the sardoba. The entrance to the sardobas was on the north or north-west side, and staircases leading down to the bottom of the sardoba reservoir started 6–8 meters away from them. The top of the stairs was covered with a long corridor-like structure.

Naturally replenished sardobas: Snow-rain water filled the sardoba reservoir by itself.

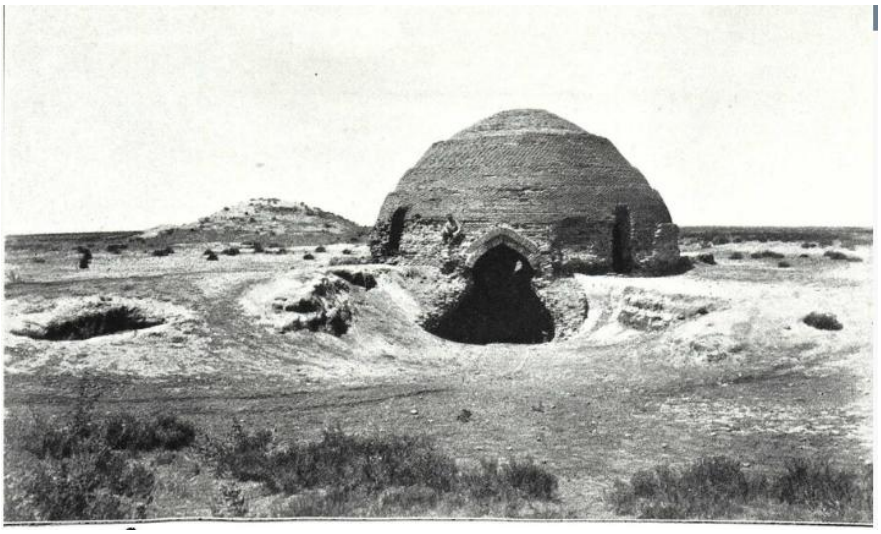
Artificially replenished sardobas: Filled with water from wells, qanats (kariz), rivers, and canals.

Mixed-type replenished sardobas: Filled by snow-rain, canal, and *paynov* water; this type of sardoba was often located near rivers and areas with irrigated agriculture.

Based on archaeological research, during the era of Amir Temur and the Timurids in the 15th century, there were practically two capitals, and many roadside structures were built along the trade routes connecting them to neighboring territories. The first part of the roads leading from Herat to Samarkand passed through the crossings in the middle reaches of the Amu Darya. Important international routes connecting to the Golden Horde cities in the northwest and Eastern Turkestan and China in the east were significant [3].

According to data, forty-four of the existing sardobas in Central Asia have survived to date. Twenty-nine of these are located in the Qarshi Steppe, ten in Turkmenistan, and another part is situated between Syr Darya – Tashkent and Jizzakh – Chinaz. In 1996, the Jizzakh archaeological expedition conducted research to determine the construction history and chronological date of the surviving sardobas [3].

The **Mirzarabot Sardoba** is located in the Sardoba village of the Oqoltin district. Currently, the upper part of the Mirzarabot sardoba is destroyed. The historian Ya. Yakovlev noted that the Mirzarabot sardoba was mapped by the topographer N. Khanikov in 1842. Furthermore, N. Khanikov recorded that the 1871–1872 Turkestan Album contained a drawing of the Mirzarabot sardoba.



1.Figure Mirzaobat Sardoba. Condition in 1910–1913. Source: Golodnaya Step (Hungry Steppe). Murza-rabat Sardoba - Photos of the Past.

E. Schuyler noted that this image depicts the stairs leading down to the reservoir inside the sardoba. In 1870, the Russian traveler **U. Tatarinov** stated that the ruins of the sardoba were built near the caravanserai and provided some dimensions of the object. He recorded that the inner diameter of the sardoba was 6 *sazhens* (1 *sazhen* ≈ 2.13 m), which is 12.78 m, the width of the lower foundation was 1.30 m, and the total height of the wall from the floor level was 6.35 m. According to **K. Karavayev**'s data, the Oghochli sardoba had three windows, while the Mirzarabot sardoba had seven.

Another structure, the **"Yakka" Sardoba** (Solo Sardoba), was located 13 km north of the Mirzarabot sardoba. Currently, the site where the sardoba was built has been developed. Information about this sardoba was first recorded by the Russian traveler **L. F. Kostenko** in his memoirs. Since this unique structure is now destroyed, one can only rely on written records. According to L. Kostenko's data, the sardoba had a semi-spherical shape, with the wall section and dome built from square baked bricks. The wall section started from the ground level, its thickness was 1.5 m, the total height of the wall from the ground level was 7 m, and the internal diameter of the sardoba was 15.80 m. It was noted that the sardoba had seven arched windows on its side. The area around the reservoir was laid with quality baked square bricks and

had a depth of 4.30 m. Skylights (*tuynuk*) were left in the upper part of the sardoba dome, and "*qulfak*" (sluice/inlet) holes were left in the lower part for water to flow into the reservoir. It was determined that water was supplied to the reservoir from the Syr Darya river through artificial irrigation branches.

Written data from the studies indicate that the height of sardoba domes could range from 6.20 meters to 12 meters, the diameter of the reservoirs from 11.20 m to 16 m, and the depth from 4 meters to 10 meters. Thus, the Oghochli and Mirzarabot sardobas in the Mirzachol were filled with snow and rainwater during the autumn and spring months, while the Yakka sardoba, according to L. Kostenko's conclusion and subsequent research results, was replenished via an artificial irrigation branch brought from the Syr Darya. In the 16th century, we can see the Oghochli sardoba, Mirzarabot sardoba, and "Yakka" sardoba in the Mirzachol area. Currently, the local population previously used the water from these sardobas for drinking and watering their livestock.

2.Figure The current condition of the Yog'ochli Sardoba. Yo'gochli Sardoba, front view - Yog'ochli Sardoba - Wikipedia

Thus, the first structures similar to sardobas were built in the 10th century, and the **"Hovuzi Said"** structure can serve as an example of this. Furthermore, in the 11th–12th centuries, wells were dug and filled with water at the sites of caravanserais built on trade routes; that is, spring water was channeled into these wells. Subsequently, during the Timurid period, sardobas were constructed next to some caravanserais, establishing trade.

In the second half of the 16th century, **Abdullah Khan II**, who united Mawarannahr and Khorasan to establish the Khanate of Bukhara, was famous not only for his military victories but also for his patronage of the arts and sciences. The *Abdullanoma* records information about the **Qoravulbozor Sardoba** on the Qarshi-Bukhara trade route, built by Kukaldosh Qulbobo, and the nearby caravanserais. The sardobas built along the Qarshi-Bukhara, Qarshi-Amu Darya, Khujand-Tashkent, and Jizzakh-Chinaz routes were highly significant in developing the trade culture in Mawarannahr. Sardobas were considered one of the main architectural structures marking the direction of the ancient caravan route branches [4].

Conclusion. This article has thoroughly analyzed the historical, logistical, hydro-technical, and socio-cultural significance of Central Asian sardobas within the Silk Road system. The research was based on medieval sources, archaeological data (G. A. Pugachenkova, R. Kh. Suleymanov), and field research findings (M. Pardayev). The conclusion demonstrates that sardobas constitute a complex of strategic structures of vital importance that ensured the continuous and safe implementation of transcontinental trade in arid regions.

Strategic Logistical Basis: The sardoba system served as the logistical "lifeblood" of the Silk Road. Specifically, the data from the Jizzakh archaeological expedition (M. Pardayev) confirm that all three caravan routes from Jizzakh to China were sustained by water sources like Sardoba, Mirzarabot, and Yakka Sardoba. The placement of sardobas at intervals of a single day's caravan journey (approximately $30-45$ km) guaranteed the water needs of travelers and livestock, maximizing the safety and throughput of the desert route.

Hydro-technical and Architectural Perfection: The architectural structure of the sardobas (a reservoir with a diameter of 11.2 m to 16 m and a depth of 4 m to 10 m, thick walls, and a dome) is a unique solution in Central Asian hydro-engineering. Air exchange (ventilation) was ensured through skylights, windows, and lower inlets positioned opposite the wind flow direction in the dome, which helped keep the water cool and clean year-round. As seen in the example of the Yakka Sardoba in the Mirzachol, sardobas were replenished not only by rain and snow melt but also via special artificial irrigation branches from the Syr Darya. This indicates that sardobas were a system adaptable to both artificial and natural water sources.

Factor for Socio-Economic and Political Development: The complex of sardobas and caravanserais (rabats) played a crucial role in developing the trade culture. Their active construction during the reign of Abdullah Khan II along routes such as Qarshi-Bukhara and Khujand-Tashkent indicates that these structures were a key element of state-level economic strategy. Their surroundings also served as a foundation for the emergence of local settlements and economic activity centers (e.g., Qoravulbozor) dedicated to animal husbandry and trade.

In summary, sardobas ensured the continuous operation of the Silk Road and were a source of life for caravans and the population along the route. The **44 surviving sardobas in Central Asia** (especially 29 in the Qarshi Steppe) are an invaluable example of the region's cultural heritage, reflecting the ecological knowledge, engineering mastery, and strategic approach to transcontinental trade of our ancient ancestors. The study of sardobas can still provide important practical lessons for water conservation and sustainable infrastructure development in the desert regions of Central Asia today.

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