TRADE-CARAVAN ROADS AND STONE ARCH BRIDGES IN MACHAKHELI GORGE

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Abstract: Roads and bridges in Georgia, as means of communication, have been of essential, vital importance for the population since ancient times. According to the numerous actual materials and these samples of material culture that have been well preserved and reached to this day in a damaged form, a clear picture of the significant and orderly road-bridge construction, which was widely developed in Georgia, unfolds before our eyes. The mountainous terrain also determined the appropriate way of building bridges. Narrow and easily accessible places were chosen for them.

The construction of stone arched bridges in Ajara should have started from the IX-X centuries. At this time, as one of the nobles of the "Georgian Kingdom", it directly participates in the historical processes that took place in southwestern Georgia, including Artanuji. The vast majority of bridges built in Ajara are located on the roads leading to historical Samtskhe-Javakheti, Shavshet-Imierkhevi, and Artanuji. In this regard, the arch bridges in the Machakheli gorge played a very important role, most of which have reached us in their authentic form.

The caravan road passing through the Machakheli gorge connected with the central road leading to the coast in the direction of the Chorokhi river. It should also be emphesized that the road leading to Klarjeti in the Machakheli gorge is one of the important routs in the old road system of Chorokhi basin. This is clearly indicated by the presence of many stone arch bridges on this road.

The paper besides aims to highlight the stone arch bridges built on the Machakheli River and its tributaries (both in the territory of the Republic of Georgia and the Republic of Turkey), a significant part of which has survived to this day in its authentic form.

Key words: Trade-caravan Roads; The Medieval Era; Machakheli Gorge; Stone Arch Bridges.

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აბსტრაქტი: საქართველოში გზებსა და ხიდებს, როგორც საკომუნიკაციო საშუალებებს, მოსახლეობისთვის ძველთაგანვე არსებითი, სასიცოცხლო მნიშვნელობა ჰქონდა. მრავალრიცხოვანი ფაქტიური მასალისა და დღემდე კარგად შემონახული და დაზიანებული სახით მოღწეული მატერიალური კულტურის ამ ნიმუშების მიხედვით, ჩვენს თვალწინ იშლება ნათელი სურათი იმ მძლავრი და მოწესრიგებული საგზაო-სახიდე მშენებლობისა, რომელიც ფართოდ იყო განვითარებული საქართველოში. მთიანმა რელიეფმა ხიდების მშენებლობის შესაბამისი ხერხიც განსაზღვრა. მათთვის ირჩევდნენ ვიწრო და ადვილად მისადგომ ადგილებს.

აჭარაში ქვის თაღიანი ხიდების მშენებლობა IX-X საუკუნეებიდან უნდა დაწყებულიყო. ამ დროისათვის იგი, როგორც „ქართველთა სამეფოს“ ერთ-ერთი საერისთავო, უშუალოდ მონაწილეობს იმ ისტორიულ პროცესებში, რომელიც მიმდინარეობდა სამხრეთ-დასავლეთ საქართველოში, მათ შორის არტანუჯში. აჭარაში აგებული ხიდების დიდი უმრავლესობა სწორედ იმ გზებზეა განლაგებული, რომელიც ისტორიული სამცხე-ჯავახეთის, შავშეთ - იმიერხევისა, თუ არტანუჯისაკენ მიემართებოდა. ამ მხრივ, ძალზე მნიშვნელოვან როლს ასრულებდა მაჭახლის ხეობაში არსებული თაღიანი ხიდები, რომელთა დიდმა ნაწილმა პირვანდელი სახით ჩვენამდე მოაღწია.

მაჭახლის ხეობაზე გამავალი საქარავნო გზა უერთდებოდა მდინარე ჭოროხის მიმართულებით ზღვისპირეთისკენ მიმავალ ცენტრალურ გზას. აღსანიშნავია ისიც, რომ მაჭახლის ხეობაში კლარჯეთისკენ მიმავალი გზა ერთ-ერთი მნიშვნელოვანი მონაკვეთია ჭოროხის აუზის ძველ გზათა სისტემაში. ამაზე ნათლად მიუთითებს ამ გზაზე არსებული ქვის თაღიანი ხიდების მრავლად არსებობა.

ნაშრომში სწორედ მდინარე მაჭახელსა და მის შენაკადებზე (როგორც საქართველოს, ისე თურქეთის რესპუბლიკის ტერიტორიაზე) აგებული ქვის თაღიანი ხიდებია წარმოდგენილი, რომელთა მნიშვნელოვანმა ნაწილმა დღემდე თავდაპირველი სახით მოაღწია.

საკვანძო სიტყვები: სავაჭრო-საქარავნო გზები; შუა საუკუნეები; მაჭახლის ხეობა; ქვის თაღიანი ხიდები.

Introduction - Machakheli gorge was historically one of the significants regions, which is clearly demonstrated by the rich material cultural heritage monuments here. Moreover, the trade-caravan road passing here connected with the central road leading to the coast in the direction of the Chorokhi River. The road leading to Klarjeti in the Machakheli gorge is one of the important sections in the old road system of Chorokhi Basin. It is also interesting that not only in this gorge, but also in the territory of Ajara, the vast majority of bridges are located on the roads leading to historical Samtskhe-Javakheti and especially to Shavsheti, Imierkhevi and Artanuji. Thus, it is likely that both in Tao-Klarjeti and in the adjacent Machakheli gorge, the construction of the majority of bridges began in the IX-X centuries, however, their construction did not stop later either.

Methods - The study carried out for the preparation of the paper is mainly based on proven methods in the disciplines of history and archeology. Based on the specificity of the research topic, preference was given to the use of the universal methodology of historicism and objectivism. In relation to the research issue, we used analysis and synthesis, critical-analytical methods.

Discussion - Bridges have played an important role in the life of one or another state since time immemorial, they had a huge strategic purpose and represented such means of communication around which villages and later cities were built. This is how the old capital of Georgia, Mtskheta, then Tbilisi, etc. was developed.

The mountainous terrain of Georgia, which creates a narrow bed for most rivers, determined the way bridges were built. Narrow, easily accessible places were chosen for bridges, and more often, single-lane bridges were built. Each river, each ravine is characterized by its individual characteristics: period of flooding, maximum water level, speed of accumulation of water in the bed after rains, etc. (Figurovskii I. V., 1898)

Over the centuries, the bridges were constantly affected by atmospheric precipitation. During the flood, they resisted the heavy downpour of the water. These buildings, turned into a single monolithic mass of stone and mortar, speak of in-depth knowledge of construction and tremendes experience of this work.

Many old bridges are preserved on the territory of Georgia. In addition to the bridges that have survived the times. Mainly preserved as the remains of their piers. These monuments, with a few

exceptions, are still unexplored today (Figurovskii I. V., 1898) (Kvezereli N., Kopadze M.,, 1972). It is likely that in Georgia, in earlier times, wooden bridge crossings were mostly common, which was due to the existence of a large supply of high-quality wooden material suitable for construction and its ease of processing (Kvezereli N., Kopadze M.,, 1972). In the next age, at the next stage of the development of Georgian construction art, on the basis of local high-quality building stone and binding material (mainly mortar), the conditions for the construction of stronger and more durable stone arch-vaulted bridges were created. Such bridges, despite the difficulty of construction, were outstanding by a particularly characteristic gracefulness.

Even in ancient times, Georgians found practically the most rational form of the arch, which made it possible not to use expensive, painstakingly smoothed straight wedge-shaped stones in the construction of bridges, but to build thinner arches of raw tiles. They were built so densely that these bridges still stand firm today and amaze with their striking arched outline. They discovered this form of the arch several centuries before the laws of statics became known, and through calculation they found the same form that is used in modern bridge construction (Nadezhin B. M., 1943).

Unfortunately, later, when foreign conquerors invaded Georgia and the period of general decline of culture came, the rule of building parabolic arches seems to have disappeared from the art of construction, and it seems that complete arches were already used in the construction of later bridges.

From a technical point of view, the negative feature of stone bridges is that stone piles work well only in bending, so stone bridges could only be arched. As for the size and width of such bridges, it depended on the nature of the transport. Sometimes their width was equal to the passing lane of one Georgian cart. Where cart movement was impossible, relatively narrow bridges were built - for pedestrians and cattle (Kakhidze A., Mamuladze Sh., 2016) (Mamuladze Sh., Kvis Taghovani khidebi atcharashi, [Stone Arch Bridges in Ajara], (In Georgian), 2023).

It is also interesting to note that most of the stone arch bridges are concentrated in the territory of Ajara, historical Tao-Klarjeti and Chanet-Lazeti. The architecture of the existing bridges here is almost the same (Mamuladze Sh., Kvis Taghovani khidebi atcharashi, [Stone Arch Bridges in Ajara], (In Georgian), 2023).

They are mainly classified into three groups:

1. One-centered bridges based on a geometric basis (circle);

2. Four-centred bridges raised on a double, horizontal platform;

3. Circle-based stone arch bridges.

The main structural element of the bridges of the first group is the arch arrangement. Here, the trapezoid of each stone is determined by the angle determined during construction from the center of the horizontal construction platform. Thus, each wide trapezoidal stone is followed by a narrow stone, as a result of which a kind of "pseudoisodom" is created, which in turn ensures the strength and stability of the stone. Among the numerous buildings of this type, the "Chkheri arch bridge" in the Machakheli gorge should be singled out. It is important by the fact that the heels of the bridge arch are embedded directly in the rock and do not contain stone piers. The arrangement

is standard, with each large trapezoidal stone alternating with narrow trapezoidal stones (Kakhidze A., Mamuladze Sh., 2016).

The best example of four-centred bridges is the Dandalo Bridge. Here, the appearance and construction of the bridge is based on two different radiuses, during which two horizontal construction platforms are needed for the construction, which is confirmed by the above-mentioned monument. Bridges of this type are also numerous in Shavshet-Imirekhevi and Klarjeti (Tao-klarjetis dzeglebis 2014 wlis eqspeditsiebis angarishebi, [Reports of the 2014 expedition to Tao-Klarjeti monuments], (In Georgian), 2015) (Tao-klarjetis dzeglebis 2015 tslis eqspeditsiis angarishebi, [Reports of the 2015 expedition to Tao-Klarjeti monuments], (In Georgian), 2016).

As for the multi-span bridges, unfortunately, a similar pattern is not found in Ajara, although several variants of it are recorded in the territory of historical Tao-Klarjeti.

The construction of stone arched bridges in Ajara should have started from the IX-X centuries, at this time, as one of the nobles of the "Georgian kingdom", it directly participates in the historical processes that took place in southwestern Georgia, including Artanuji. The vast majority of bridges built in Ajara are located on the roads leading to historical Samtskhe-Javakheti, Shavshet-Imirkhevi, and Artanuji. In this regard, the arch bridges in the Machakheli gorge played a very important role, most of which have reached us in their authentic shape (Mamuladze Sh., Atcharistsklis kheobis shuasaukuneebis arqeologiuri dzeglebi, [Medieval archeological monuments of the Achariskalli valley], (In Georgian), 1993).

Considering various sources, scientific literature and the results of our research expeditions, it is clear that the Machakheli gorge is significant by the abundance of fortifications and road structures.

The caravan road passing through the Machakheli gorge connected with the central road leading to the coast in the direction of the Chorokhi river (Malakmadze R., Kakhidze N., Mamuladze S.,, 2024). Gvara Castle was located near the confluence of Machakhela and Chorokhi rivers, the main function of which was to control the roads passing through here. The road leading to Klarjeti in the Machakheli gorge is one of the important sections in the old road system of Chorokhi Basin. This is clearly indicated by the presence of stone arch bridges on this road (Mamuladze Sh., Gzebi, sagzao nagebobebi da safortifikacio nagebobani, samkhret-dasavlet sakartvelos istoriis narkvevebi, Atchara, [Roads, Road Structures and Fortification Structures, Essays on the History of Southwest Georgia, Adjara] (In Georgian), 2009).

From Lower Machakheli Khertvisi, the caravan route passed through the following places: Machakhlispiri, Sindieti, Goshpareti, Ajarasagmarti, Khumriani, Gogodziebi (this is the name of the place where the Tskhemlara stone arch bridge is erected), Borgnala, Nakhilisevi, Kalivake, Chkhavnari, Naduknevi, Sabanguna, Nakalakevi, Zetimere, Abano, Chakhraka, Chamakhisuri Gorge (there is also a stone arch bridge here), Gagma Kokoleti, Sikaleti, Udutikakalo, Kvitivi (here passes the modern state border of Georgia with Turkey), Gorgadzieti, Khertvisi, Mindieti, Efrati. This was the main route from the roads passing through the gorge. However, it also had other branches. For example, one line of the road from Lower Chkhutuneti would turn towards Upper Chkhutuneti, pass the well-preserved Chkheri arch bridge of the same name over the Chkheri water and join the central road in Gorgadzeti. From here it went down to Upper Khertvisi and

through the village of Kvabitavi to the village of Efrati, i.e. the last village of Machakheli. Efrati itself was connected to Shavshet-Imerkhevi, Ardagan and other populated centers by the road passing through Karchkhali mountain. The second line of the road from Lower Chkhutuneti would pass through the wooden suspension bridges of Skurdidi and Ajarisagmarthi and at the confluence of the Chorokhi and Machakhela rivers, near the Gvara Castle, would join the road from Shavsheti to the Chorokhi tributary to the Black Sea. The land road passing through the Machakheli gorge was one of the shortest roads that connected the gorge to the Black Sea.

From the village of Zedvake, one line of the road goes through the small mountain pass on the Machakheli ridge and joins the road going through the Klaskuri gorge. The second one goes through Machakheli, Tetritskali, Devskeli, Shuakhevi, Bagini and other villages to the summer pastures on the northern slopes of the Karchkhali mountains. From here, the roads intersect in different directions through the roofs on the Karchkhali mountains, among them one of them went down to the Karchkhali gorge.

It is the existence of these trade caravan routes that led to the abundance of stone arch bridges in the gorge. According to the field materials, the existence of stone arch bridges is also confirmed on the Machakheli River in the village of Kedkedi, Atcharisagmarti and on the Chugati River. The remains of their piers have survived to this day (Malakmadze R., Kakhidze N., Mamuladze S.,, 2024).

● Tskhemlara Arch Bridge

The arch bridge of Tskhemlara is located on the Machakheli river, near the village of Tskhemlara. Unlike other bridges of Machakheli gorge, this bridge is significant by its highly skillful construction style, graceful and very complex construction. The local population used the bridge until the 60s of the XX century, until a new capital bridge was built next to the bridge.

The bridge has a broad, semicircular arch, the right end of which is embedded in the rocky, and the left rests on the pier built in the same name. The length of the bridge from pier to pier is 19.6 meters, the length of the carriageway is 22 meters, the width in the middle is 1.6 m, the banks at the pier are 2.1 m, the height from the river horizon to the arch is 5.5 m.

For the construction of the bridge, the builders used the flat stones plastered with mortar. The surface, as on other bridges in the region (Dandalo, Janavra, Makhuntseti, etc.), is covered with stone slabs. Two rows of flat stone piles built on mortar solution are used in the construction of the arch of both sides of the bridge. Vertically stacked capstones along both sides of the bridge along the entire length. It seems that over time, part of the original stones in the second row at the top of the front arch have been lost. Instead of them, relatively small stones of a completely different size and shape are added, which somewhat changes the original appearance of the monument. The arch bridge of Tskhemlara dates back to the XI-XIII centuries.

● Chamakhisuri Arch Bridge

Chamakhisuri Bridge is located in the village of Kokoleti. The bridge is built on the right tributary of the Machakheli river on the water of Chamakhisuri. It is relatively small in size. The length of the carriageway of the bridge is 13 m, the width in the middle part is 1.8 m, the distance from the river horizon to the arch is 5.15 m, the thickness of the arch is 45 cm.

Bridge piers are built on rocky. A parallel stack of stones (height 1.54 m, thickness - 0.24 m, and width - 0.9 m) has been removed on one side of the right pier, which should represent an element of the pier. It should also be noted that no other arch bridge in the study region is similar. The width of the bridge in the middle is 1.7 m. It has an open semicircular arch. The front arch on both sides is supported by one row of well-worked stones. They are arranged vertically on each other.

We cannot find any written information about Chamakhisuri arch bridge. There is only a narration according to which this bridge was repaired in the 18th century by Akhmed-Agha Khinkiladze from Kirkiteti.

● Chkheri Arched Bridge

The Chkheri arch bridge is located in the village of Upper Chkhutuneti, on the way to Gorgadzieti, on the left tributary of the Machakheli river - Chkheristskali, which flows from a rather high rocky slope and joins the Machakhela river. The bridge should probably be built in XI-XIII centuries.

The architects of the bridge took into account the specifics of the environment here and built it in the most favorable area near the narrow river. The length of the road surface of the bridge is 8.7 meters, the width in the middle part is 2 meters, the height from the river horizon to the arch is 14 m, the thickness of the abutment is 55 cm. The length of the right approach to the bridge is 5 meters, width - 4.2 meters. The length of the left entrance is 1.5 meters, width - 3.6 meters.

A bridge of broad semicircular arch outline, well above the water level, rests on either side on piers cut into the rocky bank. Well-hewn face stones are stacked vertically on top of each other. The upper part of the carriageway, as is fixed on other contemporary bridges, is also covered with stone slabs. The bridge is still in perfect condition, however, during the Soviet period, a vehicular bridge was built on top of it, which subsequently damaged the arch. Recently, the vehicular bridge was moved next to the arch bridge and rehabilitation works were carried out on the Chkheri bridge.

● Kedkedi Arch Bridge

Kedkedi stone arched bridge was built on the Machakheli River near the village of Kedkedi, near the settlement of the Mskhaladzes. To date, only one right pier of the bridge has been preserved.

● Gorgadzieti Bridge

The Gorgadzeti arch bridge was located in the village of Gorgadzeti, in the populated area of Tsiskvilnara, and it survived under the name "Tsikvilnara bridge". The road leading from Lower Machakheli to Khertvisi village of Upper Machakheli passed over this bridge. Due to its proximity to the state border, it was destroyed by the Soviet border guards in the 1950s, which caused the dissatisfaction of the population.

● Zvaria Arch Bridge

Another arch bridge, which was located in Lower Machakheli and is known as Zvaria Bridge, is on the continuation of the road passing through Chkheri Bridge. This bridge has not yet been

reached. Probably, it was of the type of Chkheri bridge and should have played a very important role in the unified system of trade-caravan road passing here.

● Khertvisi Arch Bridge

Khertvisi arch bridge was located in upper Machakheli, on the water of the Machakheli river. In connection with the construction of a new road, this bridge was demolished and a new bridge was built in its place. Today, only piers of the bridge remain. Taking into the account that by the piers and the distance between them (12-13 m), the Khertvis arch bridge must have been one of the outstanding buildings with its sophisticated construction.

● Buighele Arch Bridge

Buighele bridge is located in the village of Mindieti, Upper Machakheli, at the confluence of Mindieti river and buighele water. It seems that the river originally ran here, but later it changed its bed and the bridge lost its function. Today, only a small part of the piers of the bridge, built with white mortar, has survived. The current height of the piers does not exceed 1.40-1.50 meters, the width is 3 meters, and the distance between them is 12 meters. According to locals, the bridge was destroyed by "treasure hunters" in the middle of the last century.

● Mindieti Arched Bridge

There was also a second bridge in the village of Mindeti. It was built on the water of the Mindieti River and is still in its authentic form. Its existence was not known for a long time. The bridge is important by its very sophisticated architecture. It is of medium size and its piers are built directly on the rocky on both sides. The bridge rests on a semicircular arch. The curve of an arc forms a perfect semicircle. It is built with a single arrangement of well-worked stones of oblong shape. On both sides, the space between the shoreline and the hump is filled with rubble, and their side walls are built with small stones flattened on the outer surface.

The total length of the bridge is 14 m. Width - 2.45 m. The width of the driveway itself is 2.55 meters. The height of the bridge above the water surface is 9 m. The distance between the bases is 9.7 m.

● Ephrati Arch Bridge

The Ephrati bridge is located on the road to the village of Upper Machakheli, Ephrati, in the Sanaki district, on the right bank of the Chugati River. At present, a road passes under the bridge. Like the arch bridge of Buighele, here too, the riverbed has changed, due to which the bridge has lost its function, that is why the locals call it the "deaf" bridge. The height from the current surface to the arch of the bridge is 4 meters, and the distance between the piers is 7.5 meters. The length of the carriageway is 20 m.

● Vatsieti Arch Bridge

The Vatsieti Arch Bridge is located at the confluence of the Vatsieti and Chugati Rivers, 100 meters west of the Ephrati Arch Bridge. The bridge is smaller compared to other bridges in Upper Machakheli gorge. The bridge is built with relatively roughly processed stone, and mortar is used as a binding material here as well. The height of the bridge above the surface of the river is 3.8

meters, the distance between the piers is 5.8 meters, the width is 1.85 meters. The length of the carriageway is 15 meters.

From the implemented research, it can be emphesize that the trade-caravan road passing through the Machakheli gorge, which was leading to Tao-Klarjeti and Shavsheti regions, is one of the important sections in the old road system of the Chorokhi basin. This is evidenced by the many stone arch bridges built over the river and its tributaries. Based on the studies of the construction style, architectural features and other parallel materials, it can be proved that the construction of stone arch bridges in the Machakheli gorge should have begun from the IX century, which obviously continued in the following centuries.

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